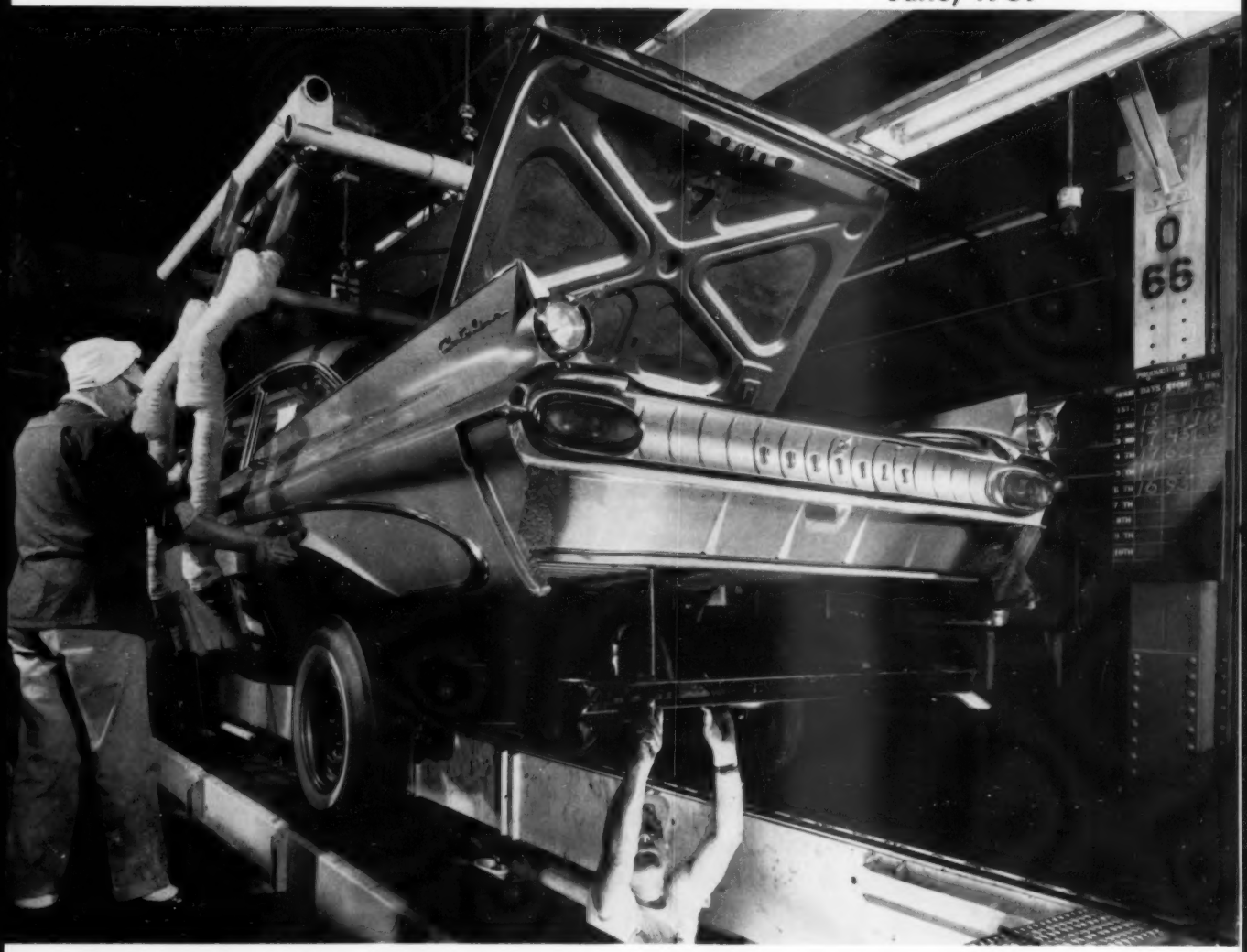
Automotive Service Digest

Our 47th year

June, 1959



Sports coupe enters last lap toward vacation highways.

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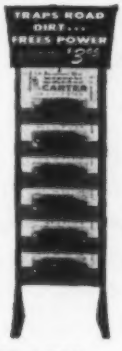

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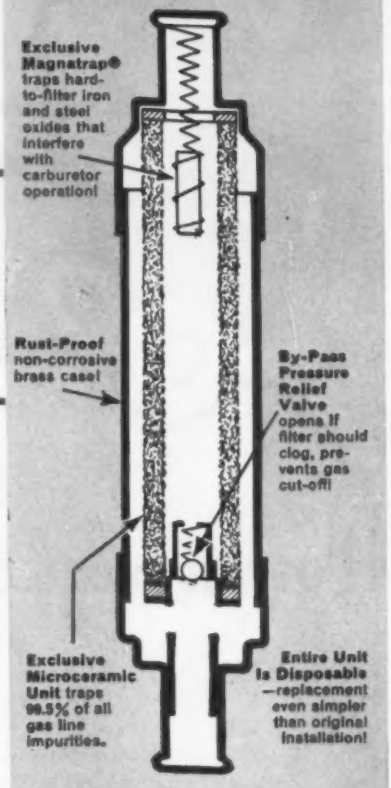
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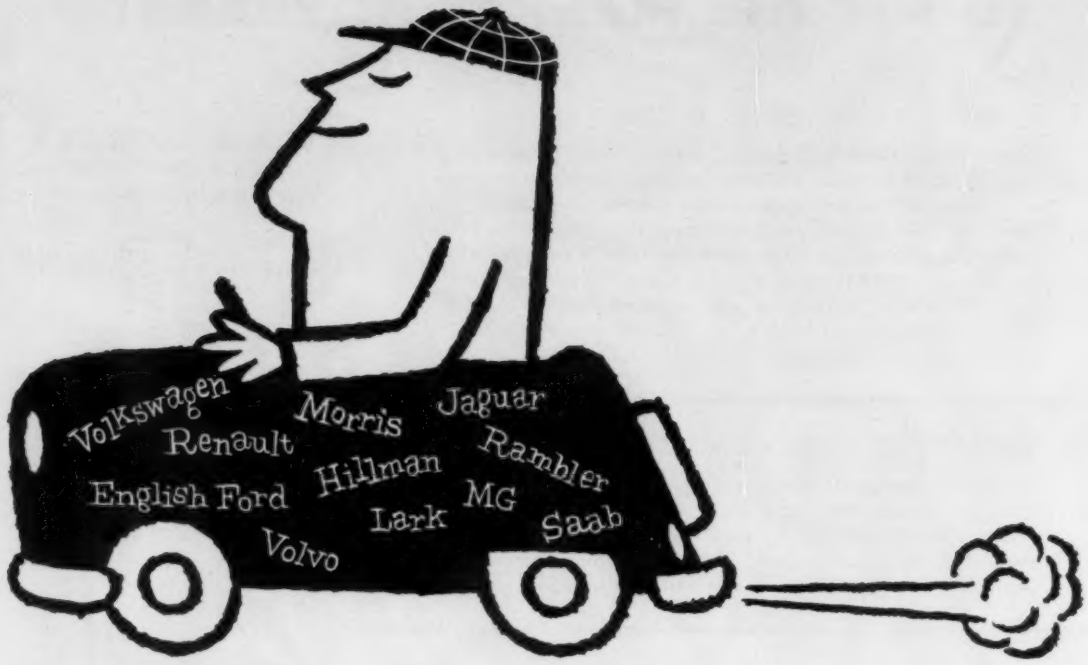

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June 1959

Automotive Service Digest

Cover Subject

Illustrating the detailed planning and scheduling of the automotive assembly line, the body of a 1959 Pontiac Catalina is "dropped" onto a pre-specified chassis from the plant's second floor. It is one in a steady stream of bodies brought by enclosed overhead conveyor from the nearby Fisher Body factory.

Articles

16 Gears in modern automobiles
20 Volvo 122S lands in U.S.
24 Fuel control systems—Last of a series
33 Rust—the radiator's enemy
34 Integral valve guide service
40 Servicing the Fiat
48 Replacing quarter panels
52 The Solex carburetor

Features

6 Automotive clinic
8 Spokes from the "hub"
15 The Editor's page
54 Photos from here and there
59 Instrument corner
62 New products
74 Trade literature
75 Calendar of automotive events
77 Refresher course

Technical help for the service shop

Tech Know-How **articles cover how-to and what's new in approved, up-to-date shop practices, as seen and understood by men experienced in the trade.** ***Business Know-How,*** **the dollar-sign side of automotive service work;** ***Service Education,*** **the who-what-where-how of today's trade training.**

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Stuck on some problem? Need help on a job? Write us about your problem on your shop letterhead and the information you are looking for will be promptly sent you.

Address your letter to Automotive Clinic c/o AUTOMOTIVE SERVICE DIGEST, 900 S. Wabash Ave., Chicago 5, Ill.

Ben Ikert, Editor

Gas In Crankcase

A 1955, V-8 Chevrolet in our shop accumulates about one quart of raw gasoline in the crankcase during 200 miles of driving. I've installed a new fuel pump, adjusted the automatic choke to a lean mixture, but still have the same problem. The car performs okeh and runs quietly, except that the hydraulic lifters are beginning to get noisy (probably due to the gas diluting the oil).

Inasmuch as the car owner is afraid of a crankcase explosion, can you put me straight on where the gas is coming from? *J.P., Whitehall, N.Y.*

Answer: Barring a possibly defective new fuel pump, the only possible source would be from the carburetor. Therefore suggest you set the float level in the float bowl according to specs, making sure the float needle valve and seat are in good shape, or put in new ones. Also, you might consider putting on a fuel pressure regulator.

With the fuel controlled at the carburetor, the only other way gasoline can get into the crankcase is past the rings. You do not say how much use the car has had, but we assume that in this four-year-old car the cylinders and rings may be pretty well worn. A cylinder leakage test will give you definite information as to the condition of cylinders, rings, and valves. Without this information, it is only a guess as to the conditions.

An Idle Knock

A 1954 Buick Special with only 16,000 miles on it has a very loud knock at idle and up to 600 r.p.m., then it leaves. It sounds as if all eight piston pins are loose, but I have checked them as well as all rod and main bearings, rocker arms, push rods and valve lifters. This knock can not be shorted out.

I used a stethoscope on the engine, and the knock seems to be coming from the front of the engine. Any suggestions?—*E.E.S., Ashland, Ohio.*

Answer: This noise could be from a water pump, which after five years could easily become worn; or the noise could be coming from worn and noisy hydraulic valve lifters which might not be pumping up fully at idle speeds. Other possible sources might be worn rocker arms, loose timing gear, loose flywheel, or end play in generator armature shaft.

The fact that your stethoscope test indicated the noise to be at the front end of the engine could point to the water pump, and we would suggest checking it.

Engine Interchanging

Can a later model Ford or Mercury engine be used in a 1953 Ford equipped with Ford-O-Matic transmission without too many alterations? What about using some other make engine? *E.W.S., Barnesville, Minn.*

Answer: You can use a 1952 or 1953 Ford V-8 truck or passenger car engine or a 1950, '51, '52 or '53 Mercury engine. To interchange between passenger cars and trucks, switch oil pan, exhaust manifold, front engine covers. To use a Mercury engine, switch water pumps.

A number of other engine makes can be adapted, if you want to go to a lot of work and expense, though in the writer's opinion the final result will not be worth it.

WHEN CHANGING YOUR ADDRESS

Please notify us 5 weeks in advance. Supply us with both your old and new address, including address label from current issue if possible. Copies we mail to your old address will not be delivered by the Post Office unless you pay them extra postage. Mail address changes to Circulation Dept., Automotive Service Digest, 900 South Wabash Ave., Chicago 5, Ill.

8-Volt Batteries

What are your thoughts on installing an 8-volt battery in a 6-volt system? It seems to me the whole electrical system would be overloaded.—*V.E.N., Mediopolis, Iowa.*

Answer: Having received a number of letters asking about installing 8-volt batteries in 6-volt systems, we talked to some very well informed people on the subject, and they are unanimous in being strongly against it.

On any car where it appears that 8 volts could be used to advantage, you will find that it needs tuning up and a thorough check of the electrical system. On a car designed for 6 volts, if there is no excessive resistance in any of the circuits and the electrical units are in good condition, with good spark plugs properly set, good breaker points, correct dwell, correct ignition timing, etc., there will be no need for more than 6 volts.

You will be avoiding trouble if you explain this to your customers. Putting 8 volts into the system is like putting an explosive in the fuel to get more power instead of seeing that the rings and valves are in good condition to give the engine its normal performance.

To keep the battery charged in an 8-volt system you would have to set the voltage regulator at about 9.5 volts, and you can see what this would do to lamps, points, etc.

Valve Breakage on T-Bird

Could you help me clear up some disagreement I've had about a valve adjustment on a 1957 T-Bird with 20,000 miles on it.

The head of one of the valves came off after a valve adjustment. The valves were adjusted with a valve gapper and checked with a feeler gauge. The valve that let loose was found with a .010" clearance and was reset to a .019" clearance. The engine smoothed down, and on a road test at 85 m.p.h. in Drive range the head of the valve came off.

Do you think any of the following could have been the cause?

Driving excessively fast in Low range, or 85 m.p.h. in Drive range (how fast will a '57 Ford go in Low range)? *(Continued on page 12)*

Top-flight mechanics choose matched sets of *Snap-on*® Boxockets® . . . Why?

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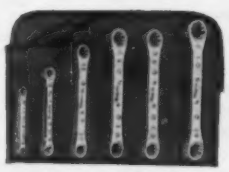
XS-606S-K DWARF BOXOCKET SET. Six single-broached Boxockets, 7 sizes from 1/4" to 5/8" in sturdy vinyl kit bag.



RB-606-K RATCHETING BOXOCKET SET. Six ratcheting Boxockets, 10 sizes from 1/4" to 7/8" in vinyl kit bag.

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XV-611-K LONG-HANDLE BOXOCKET SET. Eleven double-broached Boxockets, 16 sizes from 3/8" to 1 1/4" in strong vinyl kit bag.

BY HERB CARRIER
Detroit Editor

Spokes from the "hub"

• CARBURETOR UNLOADING was the subject of a recent service survey conducted by a major automotive manufacturer. It seems that warm weather always ushers in a rash of "stalled-and-can't-start complaints. Naturally, the complaint is most often heard from owners of cars equipped with automatic chokes, especially when they are attempting to start a partially warmed engine.

Survey results indicated that the great majority of car owners have no idea of the unloading features of their carburetors. Extensive owner education is about to break, telling car owners to floorboard the accelerator pedal when starting a partially warmed—or stalled—engine.

The tip to the tune-up mechanic is to make sure the car owner knows how to "unload" properly. This can save the tune-up man's reputation and the time and expense of unwarranted "come-backs," and minimize customer frustration.

* * *

Diesel engines are gaining in passenger car popularity. They're costly to install, but what performance!! A recent coast-to-coast run with a diesel-engined import car posted a remarkable record of 41 plus miles per gallon! The m.p.g. plus the lower initial cost of the fuel itself accounts for a big share of the interest in diesel engines for passenger car use. Diesels are also famous for long, trouble-free life.

Weight was the one big drawback for diesels in cars, but apparently this obstacle has been overcome. A good example of diesel engine's advance in adaptability can be seen in the installation of a large number in taxicabs by the Plymouth Division of the Chrysler Corp.

* * *

Low-effort power steering gears require more constant attention in the adjustment department. Several factory service bulletins have pointed up the increasing importance of checking steering gear adjustments at every lubrication period. Lack of proper preload can cause customer dissatisfaction because it gives reduced "center feel".

* * *

Warm weather has uncovered another, though somewhat isolated, engine malfunction. It has been noted that in localities where the temperatures average 70° or higher, valve train noise can become excessive.

The cause for the noise has been established as tappet malfunction. The cure is to recommend the use of HD or MS, SAE 20 or 20W engine oil. If the automobile is equipped with air conditioning, SAE 30 oil should be used.

DO NOT, say the service departments of several car divisions, use multi-viscosity oils such as 10W-30. According to the service engineers, some makes of multi-viscosity oils can cause excessive engine and tappet gumming.

If excessive valve train noise is encountered, it's suggested the engine oil be completely drained, a new oil filter installed, and the engine crankcase filled with the recommended oil —not multi-grade. After a short running period with the new oil, practically every case of excessive valve train noise that was caused by gummy tappets will clear up.

Spark plugs as used in 381 cubic inch Super D-500 Dodge engines that are equipped with twin 4-barrel carburetors (AR-32), can be replaced with A-32 with no sacrifice in engine performance. Both plugs are manufactured by Auto-Lite, but the AR-32 plug is classed as premium.

During a recent spark plug shortage at the Dodge Division, A-32 plugs were installed in the big D-500. Used in conjunction with new and improved resistor-type high-tension secondary ignition cables, the plugs delivered top-notch performance during extensive proving ground test. Consequently, Dodge Service Department is now recommending the A-32 plug over the premium AR-32 plug. The AR-32 can still be used satisfactorily, of course, but the Dodge Division now feels the A-32 plug is perfectly acceptable.

* * *

Our favorite rumor reporter assigned to the small car talk informs us about Chrysler Corporation's plans for producing their small car. According to this source of information, Chrysler intends running production of their small car in the Dodge Main Building, Hamtramack, Mich. Further reports indicate a separate production line is being set-up alongside the standard production line. In other words, Chryslers preparations for small car production is fast nearing completion. The final assembly line is one of the last things a manufacturer completes prior to actual production. And, again according to engineering rumors, Chrysler is just about ready to roll, with their "Valiant," the name most often mentioned as being assigned to the Corporation's entry into the "compact car" field.

* * *

Dateline Toronto: Automotive Engine Rebuilders Association presented a well-engineered 37th Annual Convention. Included among the hundreds of participants were service specialists from points as distant as South America and Sweden. Ninety-eight product manufacturers were on hand in booths to present the stories of their service to the service field.

Overall, the Convention tone was one of well-founded optimism, based on the BIG rebuilding market—apparently destined for still greater growth. In meeting rooms, and face-to-face talk here, those who make their living keeping rolling stock rolling subscribe to AERA's slogan: "The Market is Bright—If Service is Right." To which all knuckle-busters can only add—AMEN.

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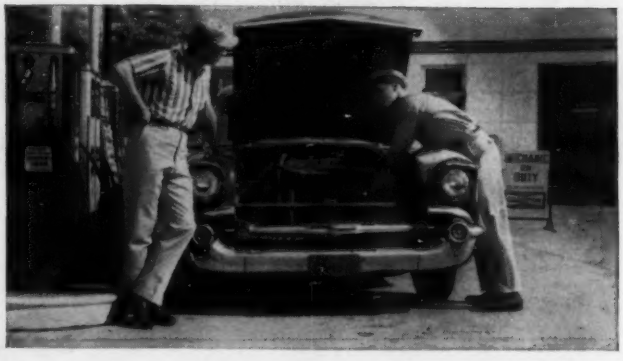
1 **Every year more than *24 million* cars are used for long vacation trips (average length 1400 miles). In fact, everyone drives more in summer. All this extra driving means a lot of extra tune-up and service business. But how can you get *your* share?**

2 **Tell everybody – "Here's the place for expert service" – with Champion's new *Mechanic On Duty* curb sign. It appeals to *everyone* who needs the help of a mechanic, whether for brake work, wheel alignment, tune-up or anything else. And bringing in more cars boosts your gasoline business, too.**

3 **This sign will remind your regular customers to put their cars in shape before they start their trips. And it will attract those out-of-town travelers who may need a mechanic. The familiar Champion name on your bright new sign helps make vacationers feel "at home" . . . builds their confidence in your service.**



trips can pay for your vacation

5 **Another time-saver** is a "one-plug check" with a free Champion "Check-A-Plug" card. Checking *one* plug will usually show if *all* the plugs need to be removed for service or replacement. And the card lets your customer see for *himself* the condition of his plugs.

4 **To make this extra business** (and all your tune-up work) even more profitable, be sure you have flex-handled "Plug-Master" wrenches and "Plug-Mate" magnetic sockets. These Champion tools speed removal and installation of plugs . . . add profit to every spark plug job.

America's favorite—
5-rib

CHAMPION
SPARK PLUGS

6 **Go after this extra business today.** Call your Champion supplier for your curb sign, "Plug-Masters" and "Plug-Mates," free "Check-A-Plug" cards — and a balanced stock of the right Champion types for all popular cars. (Vacationers won't wait while you send out for parts.) Remember — you can make enough extra profit to pay for your own vacation!

CHAMPION SPARK PLUG COMPANY • TOLEDO 1, OHIO

Automotive Clinic . . .

(*Continued from page 6*)

Could the valve have been adjusted so that it would hit the top of the piston; if so would it happen on a road test after 30 minutes of running in the shop, or would it have happened in the shop?

Could dropping something through the carburetor have done it, and would there be any evidence of this happening?

If none of the above are possibilities, what about metal fatigue? *J.W., Kennewick, Wash.*

Answer: Even the experts do not agree on the causes of broken valves. Among the causes given are: seat run-out, thermal seat distortion, inferior valve material, bad valve seating, excessive valve lash, too small under-head cross section or too large under-head cross section.

Under "seat run-out", you can see that if a seat was out .003" to .004", as many of them are, the head hitting on the high side of the seat would get pretty well hammered with a bending action on the stem. This could lead to fatigue and breakage of the stem. This is easily what could have happened.

The clearance of .019" is correct, and it is important to have the right clearance, as the quieting ramp on the cam is designed for this setting. If there is a variation of even .001" from this, the valve action will not be just right, though the engine may run.

Excessive engine speed is a contributing factor to valve breakage, though it cannot be said to be a definite cause of it. As for your question of how fast a '57 Ford will go in Low range, we would estimate about 30 to 35 m.p.h. at wide open throttle.

It is possible for the valve on some engines to be set so it could hit the top of the piston, but it is not too likely.

A possibility that could lead to valve breakage is a broken valve spring, which would let the valve extend far enough into the cylinder to hit the top of the piston.

Dropping something through the carburetor could have caused the valve to break, if the object (nut or washer) just happened to hit the valve head near the edge to give maximum leverage on the stem, though it is more probable that a hole would be knocked in the piston.

There are so many variables involved in a case of a broken valve that it is very difficult to be positive or specific as to the actual cause. In the absence of any other direct cause, the assumption of metal fatigue is as reasonable as any other cause.

Acceleration Flat Spot

A customer's '52 Studebaker Champion is giving me no end of trouble. The engine was completely overhauled and tuned up, but on occasions the carburetor loads up to the point where the engine will refuse to start, short of a push. When this happens, the fuel valve in the carburetor seems to stick.

The car also has an acceleration flat spot that I have not been able to pin down. Any suggestions you can offer will be greatly appreciated.—*L.C.F., Holyrood, Kans.*

Answer: The flat spot could be from a defective accelerating pump, and loading up is caused by getting too high a level in the float chamber. Would suggest a combustion test with a combustion analyzer.

If the "fuel valve" (by which we assume you mean the float needle valve) sticks, ordinarily this can be cured by replacing the needle and seat. When a new needle valve is put in, it is a good idea to tap the needle sharply with a light hammer when it is in place in the seat housing, to be sure it is properly seated. Be very sure that the needle works freely in the seat housing.

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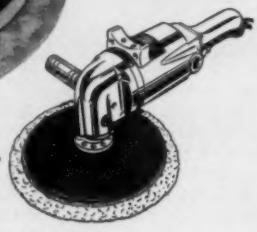

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7" dia. Model P175 — 1750 RPM

9" dia. Model P139 — 1450 RPM

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Heater Won't Heat

We are having trouble with the heater on a 1955 Cadillac. Have installed new thermostat and the engine temperature runs around 180 deg. The blowers work fine, but they blow only cold air.

We removed the inlet and outlet ends of the heater hose and ran water pressure through the lines and through the heater, but they did not seem to be clogged. Also took the lines loose from the control valve and by-passed it, thinking that it might not be opening, but with no result. It seems that the water does not get to the heater for some reason, because it will not throw it up to the control valve.

The radiator has been rodded out, circulation is good and the pressure cap holds pressure.—*A.W., Cumberland Gap, Tenn.*

Answer: Disconnect the end of the return hose and, with engine running, see if water flows through the system. If it does, then either the controls are disconnected or they are not being manipulated correctly. Be certain the controls are properly set; the right air control must be open for heater operation.

Another place to check is the outlet of the heater core. Loosen the outlet just enough for any entrapped air to escape, and then tighten the connection again.

If you by-passed the heat control and still get no heat, then either there is an obstruction in the line, or the system is air bound.

Wheel Shimmy

How can I eliminate shimmy in a 1954 Chrysler equipped with Gemmer power steering having late type reaction control valves?

When driven over a rough road the car goes into a bad shimmy. It steers nicely, steers easily, and on a good road it is fine at any speed. When the front wheels are jacked-up and given a solid kick to the front or rear side of the tire, the car will go into a shimmy if the engine is running. When engine is shut off the steering is solid.

The following has been done to the car: Front end completely aligned, shock absorbers checked and excess play adjusted out of the steering. When this did not help the power steering was disassembled and a visual inspection was made of all parts. The valve body, along with the cone-shaped bearings, was replaced, but this did not help either. I was not able to test pump pressure due to the lack of a gauge. Could a low oil pressure cause the shimmy? The rest of the parts looked in good condition.—*F. S. B., Clearfield, Pa.*

Answer: From your letter, it looks as if the oil pressure is low. With low pressure, when the wheel on either side is bumped it could set up a "hunting" effect, which would cause the shimmy referred to.

The pressure should be tested (using gauge C-3102) and should be 500 lbs. when the steering wheel is in either extreme position. If the gauge does not show 500 psi, with the wheels turned to an extreme position, the pump can be checked by closing the shut-off valve. If the pressure does not gradually increase as the valve is closed, the flow control valve in the pump may be stuck in an open position. If 500 psi does show on the gauge, the pump is in good condition.

If a gauge is not available, a fairly accurate way of making the pressure check is to start the engine and turn the steering wheel to both extreme positions. If the high pressure hose flexes, the pump is in good condition and the shimmy will then be due to trouble in the gear assembly. If pressure is low, the pump will have to be serviced or replaced. Be sure fluid reservoir is filled to proper level.

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B-6A Illustrated

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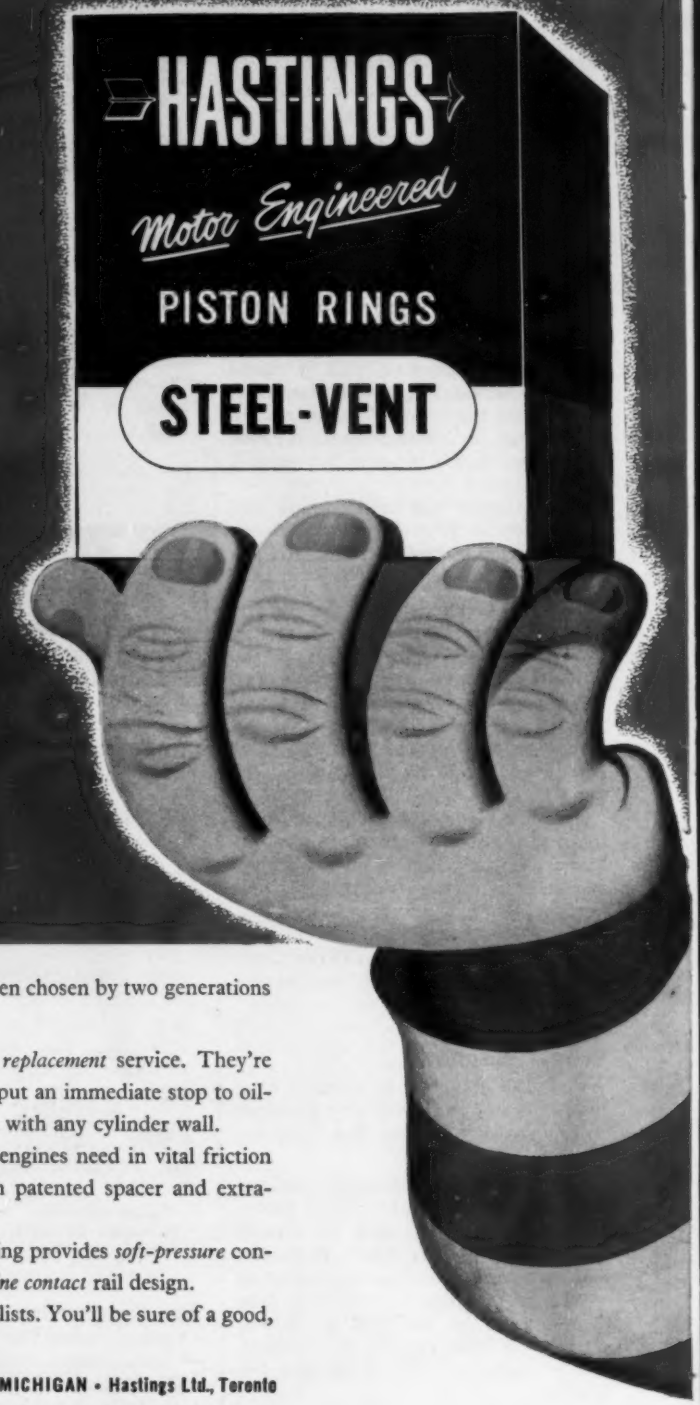

Question: Why have Hastings Steel-Vent Piston Rings been chosen by two generations of good mechanics—for literally millions of ring jobs?

Answer: Steel-Vent sets are engineered exclusively for *replacement* service. They're Motor Engineered to handle the problems *you* meet. They put an immediate stop to oil-pumping because they seat right now, make perfect contact with any cylinder wall.

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TOUGH ON OIL-PUMPING

GENTLE ON CYLINDER WALLS

HASTINGS

STEEL-VENT PISTON RINGS

Editor's page

What to tell the patient

• YOU'VE SOLD your customer on the need for engine tune-up, for replacement of worn-out spark plugs, regular lubrication, keeping wheels aligned and balanced, maintaining brakes. To these wise and valuable admonitions, you have added advice on servicing the air cleaner and cooling system, as well as the many other parts of the car that make for easy rolling of the vehicle under power.

All this is good maintenance selling—and then the car owner comes back with:

"But I wish I could get better gas mileage out of this car!"

At this point, it's very much in order for you to express diplomatically, a few driving "facts of life." You are the mechanical "Doctor," asked to prescribe a cure for excessive gas consumption.

By all means use your best carside manner as you explain. Certainly a well-maintained automobile—with its mechanical units up to factory specs, and otherwise well-groomed for prevailing driving conditions—naturally gives its owner more miles per gallon than a car sadly in need of service. But attainment of maximum gas mileage consistent with good overall performance is influenced by other factors—the most important probably being the driver himself!

Advise your customer, gently, to put his driving habits on the same "diet" as driving conditions. Both affect gas mileage. Emphasize that the faster the car is driven, the higher its fuel consumption rises.

It's pretty generally agreed that a constant speed of about 30 mph gives the best mileage. However, few persons drive the highway at that speed today—50 or 60 mph is far more common. But at 60, the fuel economy drops by 30 per cent; and the condition becomes worse at higher speed, as wind resistance increases and "drags" against the forward motion of the automobile.

Give your patient a little "pitch" on "good gas keeping." For example, to avoid long periods of idling; watch the traffic and the traffic lights ahead and accelerate smoothly—almost one-third of fuel used is consumed in getting the car underway after a stop! Point out the strain of "lacing" a cold engine; of rolling on under-inflated tires.

Right now, many motorists are planning long vacation drives, and service shops are conditioning their cars for the road. The complaint of high gas consumption will be frequent and wide-spread.

So when your customers take delivery of cars that have been conditioned and tuned for the long jaunts ahead, it's time to protect your work and your reputation. Give the customer the timely tips that will lead to healthier gas mileage.

Ben Ikert
EDITOR

Gears in modern automobiles

Nothing transmits power like a gear . . . and no component of the modern car deserves more understanding or better care from the service man. Properly designed for the load and the required performance, adequately supported and serviced, modern gears give years of trouble-free operation.

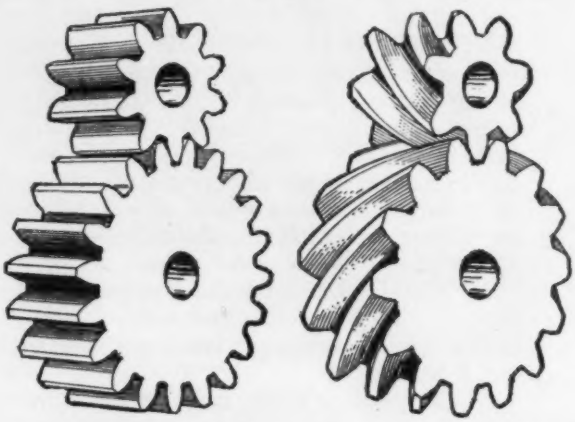
• THE SCIENCE OF GEARING is almost as old as the science of mechanics itself. When man began to harness power, means had to be developed to transmit the power. For straight power transmission, nothing can beat a gear. Fluid couplings, "V" belts, flexible shafts, etc. have all been satisfactorily applied for specific power transmission problems. In some cases, especially when cost is a major factor, straight gearing has taken a back seat to other types of transmission. However, gears still are the old dependable stand-by. Their use will undoubtedly continue for many years in the automotive field.

THREE TYPES

Basically, there are three types of gears: **spur, bevel,** and **helical.** There are other types, of course, involute splines can be classed as gears, as can worms, and even an Archimedean Screw. But if the working mechanic has a sound knowledge of the three general classes of gears—spur, bevel, and helical—he will be in position to understand quickly, any unique system of gearing that is likely to be applied on any production vehicle.

A transmission cluster gear is a good example of helical gearing in modern automobiles. The teeth are precision machined for quiet operation and long life.

Spur Gears: When gear teeth are cut straight across the face of the gear body, the resultant unit is called a **Spur Gear.** The teeth are actually at right angles to the body of the gear. This is perhaps the oldest form of gearing, and is still very popular for many applications. For example, flywheel ring gears can be placed in the spur gear department, as can many timing gears.



Left: example of straight-tooth spur gears. Teeth are parallel to center line. Right: helical gears; each tooth forms part of a spiral.

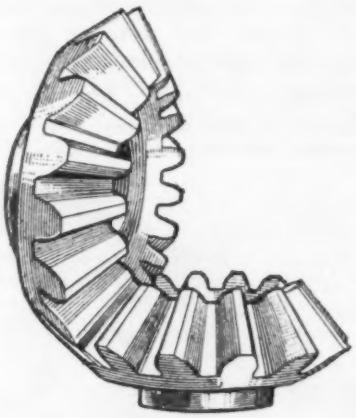
Spur gears are particularly desirable because they are comparatively inexpensive to produce. Machinery for cutting the straight teeth is much less complex than that used in cutting other types of gear teeth. In most cases, spur gears are dependable over many hours of operation.

DISADVANTAGES

Noise is a major handicap of spur gears. A whine or rumble is a characteristic condition when two spur gears are meshing together at fairly high speed.

Secondly, total power flowing through a pair of spur gears is often concentrated on just two teeth. This can be a serious handicap if the gears are subject to sudden, jarring drive-line shocks. For these two reasons, noise and power concentration on a limited number of teeth, spur gear use in modern automobiles is restricted to areas where these features are not really disadvantages. For instance, internal gears on automatic transmissions are spur gears that have been turned "inside out," and they work remarkably well for almost all automatic transmissions.

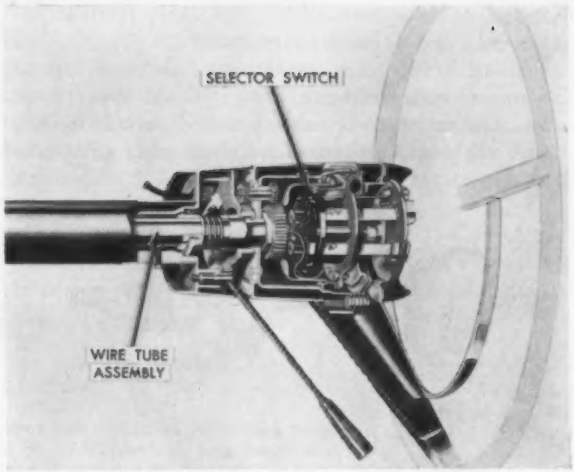
A third limitation to the use of spur gearing in modern applications is the difficulty it gives engineers in designing gear trains that will efficiently transmit power "around corners." In today's restricted design space, elaborate gear systems are out of the question. Gears must work dependably, quietly and efficiently without taking up too much room. Also, power must be transmitted in many different planes and angles. Spur gears are not easily adapted to this type of engineering.



Straight bevel gears are used for meeting shafts which are not parallel to each other.

Bevel Gears: To overcome some of the obvious limitations of spur gears, bevel gears were developed. A bevel gear is one which has its teeth at an angle to the face of the gear. This type of gear is capable of delivering power "around a corner." For example, power can be transmitted in a shaft that terminates with a bevel gear. A second shaft also terminating in a bevel gear can be placed at right angles to the first. When the two bevel gears mesh, power will literally flow at right angles to the source of supply. This is extremely advantageous when sending engine power through the transmission to the rear wheels.

By HERB CARRIER
Detroit Editor



Unique use of spur gearing (just ahead of selector switch) is in the steering shaft assembly of the '57 Edsel.

Many gears in rear axle differential units are the bevel type. Semi-floating axle shafts usually terminate in a bevel gear. In fact, some early automobiles used axle shafts on which bevel gears were an integral part of the shaft construction. Broken axle shafts automatically meant replacement of the bevel gear.

To duplicate the ability of bevel gears to deliver power at right angles, a complex system of spur gears would have to be used. From most every standpoint, bevel gears are vastly superior to spur gears when it comes to changing direction of power flow.

SHARE SPUR GEAR'S SHORTCOMINGS

Straight bevel gears also have certain disadvantages. Perhaps the major drawback is basically the same as that of the spur gear—power being transmitted is concentrated on a limited number of gear teeth at any point of the gear's revolutions. Naturally, drive line shocks, or sudden power surges create tremendous strains on a relatively small number of teeth in a bevel gear set-up.

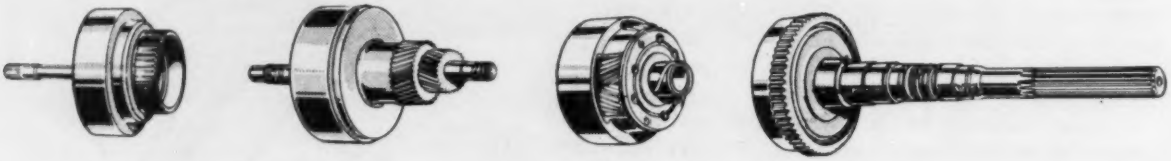
To overcome this weak point, some bevel gear teeth are not cut in a straight line. Instead, they are cut along a slightly twisting axis. In this case, the gear becomes known as a spiral bevel. Rear axle ring gears are most often cut as spiral bevel gears. The rear axle pinion gear can also be classed as a spiral bevel.

SPIRALING OVERCOMES DRAWBACKS

Spiral bevel gears used for rear axle ring gear and pinion components have many advantages. First, they can be made to run very quietly. Careful machining, correct matching, and accurate adjustments, all but eliminate objectionable running noise. Axle "howl" is always a threat, of course, but the chances of a well designed spiral bevel ring and pinion developing uncontrollable howl are quite

remote. That is, naturally, if the gears are matched, adjusted, and lubricated properly.

Spiral bevel gears can deliver noise-free running because they have much greater tooth contact area than straight spur or bevel gears. When two spiral bevel gears mesh, there is a considerable amount of metal-to-metal contact through which to transmit the power. This additional area also distributes the actual load more evenly over a greater surface than is possible with spur gears. Spiral bevel gears, then, eliminate the major disadvantage of spur gears —noisy running and limited load-carrying area.



Combinations of spur and bevel gearing are evident in this automatic transmission gear train. Each gear is designed to do a specific job, which in turn, dictates the most efficient gear to use.

Helical Gears: The third general class of gears can be identified by the "in between" look. That is, they are neither spur nor spiral bevel. The teeth are cut across the face of the gear at an angle—so it's not a spur gear—but they are not cut on a twisting line—so it's not a spiral bevel.

Helical gears are a nice compromise between the low-cost spur and the expensive spiral bevel. The noise level is considerably reduced when helical gears are used instead of spur gears, and tooth contact is also improved. Helical gears are used wherever they will do the job.

Transmission gear trains—both automatic and standard-shift—are composed of many helical gears. Many reduction trains use helical gears. Applications in which the gears are in constant mesh, but which require strength and low-noise-level operation can often take advantage of the benefits to be found in helical gears.

Again, like the spur gear, helical gears are rather unsuited to transmitting power "around corners." Helical gears can be arranged to do so, but generally the bevel type is used when power must be split in several directions. An exception can be found on machine tools, where one helical gear is sometimes placed at an angle, on top of another helical gear. This set-up is not ordinarily found on automotive passenger cars.

OPERATING CONDITIONS AND SERVICING

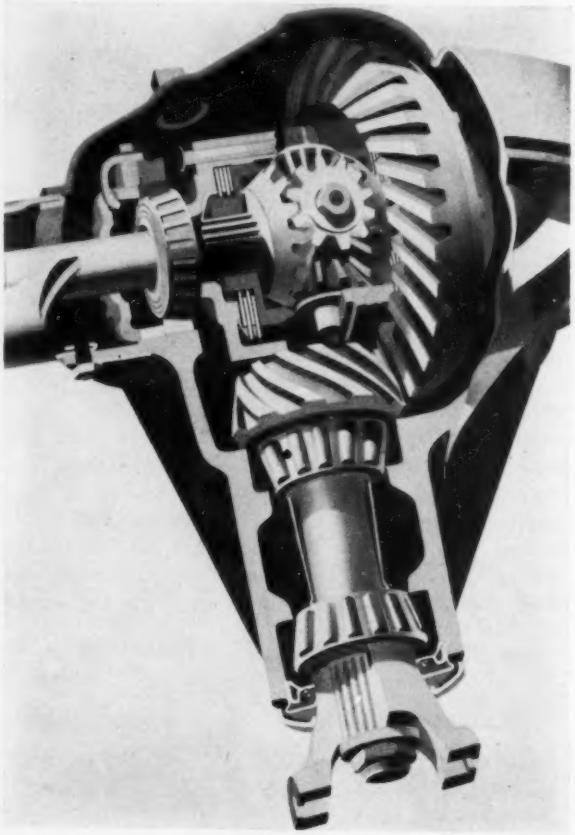
There is little the working mechanic can do to change the gearing used on any particular automobile. The gears are designed and installed by the manufacturer; mechanics need only maintain correct operating conditions for the gear sets, or replace the worn or broken units with new ones when the operating condition maintenance has been neglected long enough to cause gear failure.

Some of the replacement procedures can become quite complex and require careful, accurate workmanship as well as a solid understanding of the construction of the unit being serviced. For example, automatic transmissions must be serviced by competent mechanics. Rear axles are also worthy of a little advance information and experience.

Let's take a look at the overhaul of an axle to see what is involved in servicing a set of hard-working gears. We'll select the 1955 Chevrolet passenger car rear axle as an example.

In this case, let's assume the wheels and axle shafts have been removed, the drive shaft dropped, and the differential assembly removed from the axle housing. Our overhaul procedure starts with the differential assembly mounted in a bench-top holding fixture that can be rotated whenever

Rear axle equipped with both straight bevel gears (differential assembly) and spiral bevel ring gear and drive pinion.



necessary to provide ready access to the components.

DISASSEMBLY

Start the disassembly procedure by scribing a line on the bearing caps and the differential carrier so the caps can be replaced in the proper position. Remove the adjusting nut locks that retain the adjusting nuts in position. Then remove the bearing cap bolts and the bearing caps. It might be necessary to tap the bearing caps with a soft-faced hammer to break them loose from their seats. Do not use a screwdriver or similar tool to pry off the caps.

With the caps removed, lift the differential case assembly out of the differential carrier. The adjusting nuts and the bearing outer cups should be lifted out as part of the assembly. Be careful not to drop the cups or adjusting nuts.

Remove pinion shaft lockscrew and slide the pinion shaft out of the case. Lift out the differential pinion gears and the differental side gears. Use a puller to remove both case side bearings. Remove the bolts and lockwashers which retain the ring gear to the case. Then use the soft-face hammer to tap the ring gear free of the case. This completes the differential case disassembly.

For the pinion gear, scribe an alignment mark between the pinion and the companion flange. Remove pinion shaft retaining nut and lockwasher, then use a puller to remove the companion flange from the pinion shaft.

Again, use the soft-faced hammer to tap the pinion shaft out of the differential carrier. The inner bearing will come out with the pinion shaft. Remove the outer bearing, the bearing spacer, and the oil seal from the front of the carrier. Discard the spacer and the oil seal.

Closely inspect the ring gear and pinion. Note that these are spiral bevel gears. If there are any signs of scuffing, cracks or chips, both gears must be replaced. This is standard practice, because ring and pinion gears are supplied in matched sets. All sets are actually "run-in" at the factory so that they are a pair of gears. It's almost impossible to buy just a ring gear, or just a pinion gear. Reliable manufacturers sell them only as matched sets. Replacing only one, chances of getting quiet operation from it would be just about nil. This is because an accurate ring and pinion adjustment would be practically impossible to obtain.

RE-ASSEMBLY

After a thorough cleaning and inspection, the acceptable or replacement parts are all set for assembly into the case and carrier. Part of the inspection procedure should include a close look at the condition of the case and carrier. Watch very sharply for any sign of hairline cracks.

Start assembly by preparing the pinion. If the old one is to be used, and the pinion bearing was not removed from the shaft, pinion depth adjustment should be O.K., because the adjusting shims located between the pinion and the pinion bearing will not have been altered. However, if a new pinion, or pinion bearing or bearing cup, is being used, careful shimming is necessary to make sure that the pinion meshes with the ring gear in just the right spot. This is called the "depth" adjustment.

This particular make and model ('55 Chev.) uses a number system to determine pinion shim selection. For example, if the etched number on the differential

Dial indicator mounted on differential carrier for determining amount of back-lash between ring gear and pinion teeth.

carrier is "S-1," and the marking on the replacement pinion is "+1," a .030-in. shim pack must be inserted between the rear pinion shaft bearing and the pinion gear.

With the correct shim pack installed, place the pinion shaft in the differential carrier. Slide a new pinion bearing spacer over the pinion shaft. Then install the front pinion shaft bearing and a new oil seal. Use a driver to "bottom" the seal correctly. Align the scribe mark made during disassembly, and install the companion flange. Install washer and companion flange retaining nut.

PRE-LOADING PINION BEARING

Now, we're ready for a second adjustment to insure quiet-running and long life. This is the pinion

(*Continued on page 78*)

Volvo 122S lands in U.S.

• "ROADWORTHY BEAUTY" is the manufacturer's description of Volvo's Model 122S, which recently made its entry into the domestic market. Better known to some as the "Amazon," this six-passenger four-door differs markedly in appearance from the firm's familiar family sports sedan. Model 122S is offered as the "regal-styled" answer to those who want "pace, character and pride of ownership" in an imported car.

Mechanically, it's described as outstanding in design and performance—thrifty on gas and oil, capable of outstanding acceleration and sustained high speed. Its engineering fine points include improved and simplified lubrication, new rear wheel suspension, suspended pedals, extra-rigid steel body construction, thorough rustproofing.

STRESSES SAFETY THEME

Up-to-date provisions for maximum protection to driver and passengers are built into the four-door, 85-h.p. 122S. Safety belt fixtures are standard. For front seat safety, the instrument panel, front edges of the doors and sun visors, are double padded. The steering wheel will buckle, but not splinter, and has no sharp hub to cause injury.

Rear doors are fitted with "childproof" locks; before they can be opened, a catch button must be pulled up. Handles turn upwards, as an additional precaution against accidental opening.

Tubeless tires, claimed to be virtually burst-proof and to lose pressure very slowly if punctured, are standard. Windshield is of laminated, splinterless glass. The brakes are powerful, self-adjusting and self-centering; have 153 square inches of effective braking surface.

SPECIFICATIONS

ENGINE: 4-cyl. OHV, 97 cu. in.; 3.125-in. bore, 3.15-in. stroke; 85 b.h.p. at 5,500 r.p.m.; 87 lb. ft. torque at 3,500 r.p.m.; compression ratio, 8.2:1.

IGNITION: six-volt, battery and coil.

CARBURETION: twin SU horizontal carburetors.

TRANSMISSION: single dry plate, hydraulically operated clutch; fully synchronized gearbox; four speeds forward, one reverse.

BRAKES: self-centering hydraulic Duo-Servo type; 10-in. drums, 165-sq. in. lining area.

SUSPENSION: **front**—individual coil springs and control arms; double-acting hydraulic, telescopic shock absorbers; stabilizer. **Rear**—coil springs; axle carried on two rubber-mounted support arms, two torque arms and a track bar; double-acting, telescoping hydraulic shocks.

ELECTRICAL: 85-amp. hr. battery; 50-amp. fan-cooled generator, automatic voltage control; 0.75-h.p. starter motor; two-speed windshield wipers.

INSTRUMENTATION: fuel and temperature gauges; speedometer, mileometer; warning lamps for battery charging, oil pressure, directional signals, headlamp beams; rheostat controlled panel lighting.

BODY-CHASSIS: all-welded integral steel construction, rust-proofed; undersealed fenders.

DIMENSIONS: wheelbase, 102.4 in.; overall length, 175.2 in.; overall width, 63.8 in.; tread, 51.8 in. front and rear; ground clearance, 7.9 in. unloaded, 6.7 in. with four passengers; curb weight, 2,400 pounds.

"Bonus" conveniences are part of the "deal" for Model 122S. It has an anti-theft lock to assure it will be waiting where parked; "deceptively large" trunk; storage shelf out of sight beneath rear window.

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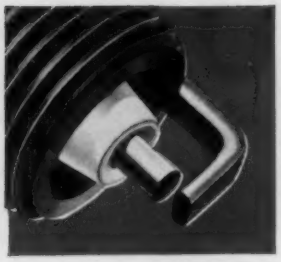


AUTO-LITE Spark many 1959 Mobilgas as all other spark

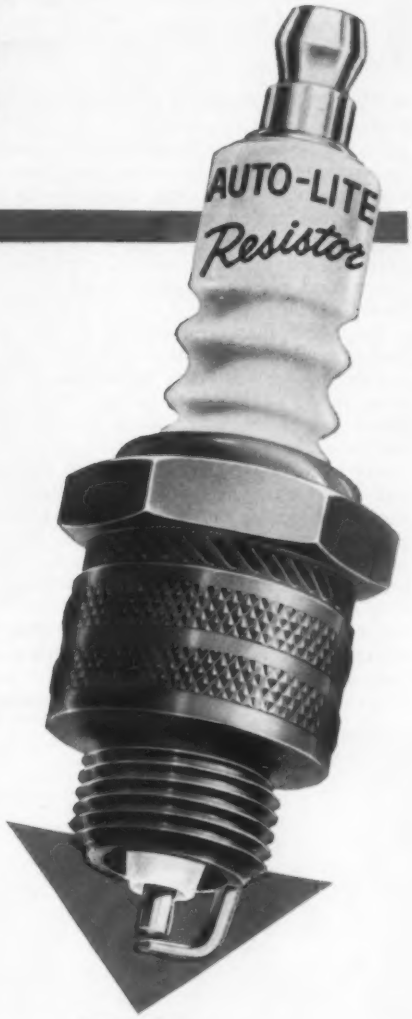
Cars equipped with Auto-Lite Spark Plugs win 8 of 12 top positions by finishing 1st in classes A, C & D and 2nd in classes A, C, D, E & F.

RUGGED TEST SUPERVISED BY IMPARTIAL ORGANIZATION

The Mobilgas Economy Run, sponsored annually by Socony-Mobil, is rigidly supervised by observers provided by the Sports Commission of the United States Auto Club. Observers in every car make sure that cars operate at legal speeds, are never coasted, and observe all traffic laws.

Plugs "fire up" twice as Economy Run winners plugs combined!

In actual miles per gallon, regardless of class, cars using Auto-Lite Spark Plugs take 6 of the top 10 places including 1st and 2nd.



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By HERB CARRIER
Detroit Editor

Fuel control systems

Converting liquid gasoline into mechanical energy involves more than carburetion. Air filters, manifolding and exhaust systems — all play an equally important role in providing efficient, economical engine operation from tank to tailpipe under constantly changing conditions.

• TWO THINGS—noise and odor—can be relied upon to indicate a defective exhaust system. However, long before either noise or odor is detected, it's possible for the exhaust system to be operating less than satisfactorily. A small leak in the system is not easily heard, and pure carbon monoxide is odorless as well as colorless. It's very important, therefore, to inspect the entire exhaust system carefully at regular intervals, preferably during chassis lubrication when the vehicle is on the hoist. Trouble can then be caught before it becomes serious.

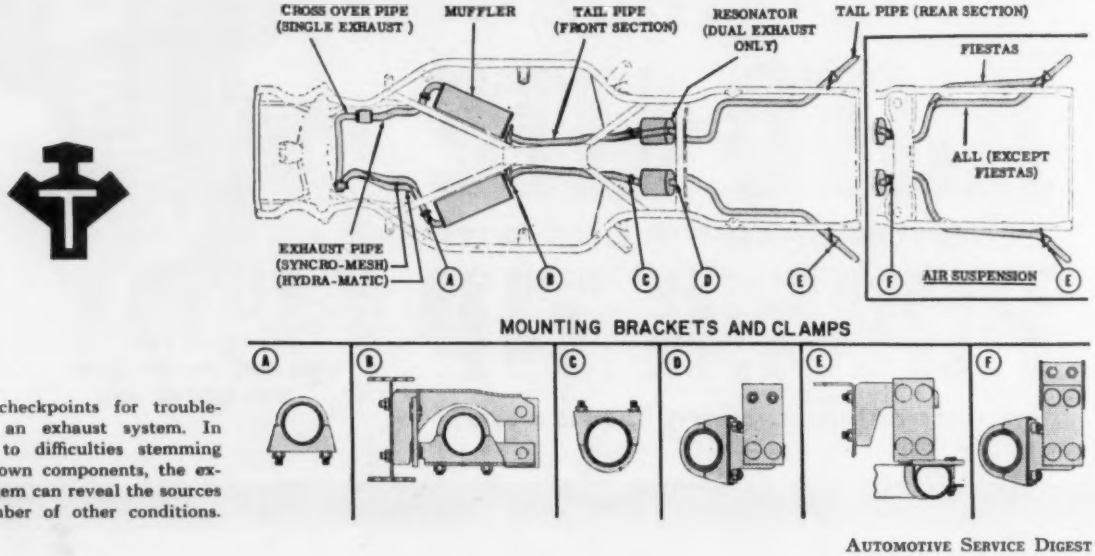
The same reasoning applies to the remainder of the fuel control system. There is a wide gap between actual engine misfire and poor performance. There are many areas in the fuel control system which can cause operational difficulties. Often these areas overlap so that the end result is a grossly magnified error. Periodic maintenance such as engine tune-ups, or replacement of worn out components like mufflers and tailpipes will aid to keep the entire system operating at peak efficiency.

There are times when normal maintenance is not enough. This is when all the standard procedures have been performed but the vehicle still isn't running right. This is when the mechanic must resort to trouble shooting, or looking for the cause or causes, that are out of the ordinary and a little more difficult to locate.

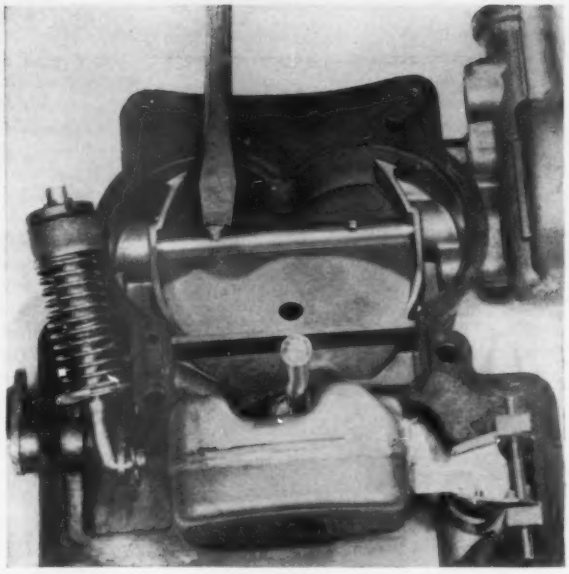
Part VII—Trouble Shooting

Carburetors are heir to many operational malfunctions. They are the most complex component of the entire fuel control system. The circuits of a modern carburetor are separate and distinct. Knowing which circuit, or circuits, are in operation when the particular complaint occurs, will be a big help in trouble shooting the carburetor.

For example, if the engine flattens out on acceleration, it's an indication that the acceleration pump is not operating properly. In most cases, the ball check in the bottom of the accelerator pump well is not seating properly. When the accelerator pump plunger is forced down in its bore, the inlet ball check doesn't seat properly. Instead of gasoline being forced through the outlet ball check, through the discharge nozzle, and into the carburetor throat, it is actually forced through the unseated inlet ball check into the main fuel reservoir from where it came. Lacking the extra slug of fuel to boost the engine through the period when intake manifold vacuum is virtually destroyed because the throttle was cracked open, the engine flattens out until the throttle is again partially closed and vacuum restored. Looking directly to the accelerator pump circuit when trouble shooting this type of complaint will save much time and effort.



Typical checkpoints for trouble-shooting an exhaust system. In addition to difficulties stemming from its own components, the exhaust system can reveal the sources of a number of other conditions.



One tough-to-locate trouble maker is a loose choke valve in the carburetor air horn. The flat retainer screws are staked in position so that they seldom can work loose—but if one does come free from its position, trouble really begins.

Other conditions can cause similar engine malfunctions. Retarded timing, excessive point gap, inoperative distributor advance mechanism, fouled plugs, and several other things can cause the engine to flatten out in the same manner. To determine if the trouble is electrical or mechanical, remove the air cleaner assembly and peer down the carburetor throat while operating the accelerator pump linkage by hand. *Do not have the engine running during this check.*

If the pump circuit is O.K., a steady stream of gasoline will be forced out of the discharge nozzle every time the pump plunger is forced downward by operating the accelerator pedal linkage. If the gasoline comes out of the discharge nozzle in a short, erratic burst, rather than a steady even stream, it indicates the ball checks are partially stuck, or the leather pump packing is dried out and cracked, or the spring on the plunger shaft is weak or broken. It could also mean the passages in, or to, the discharge nozzle are partially plugged. Some nozzles have a valve, resembling a float needle valve, located in the area below the nozzle. If this valve isn't operating properly, the discharge shot will be adversely effected.

CLIMATIC CONTROL

Many accelerator pumps have provisions for a seasonal setting of their operating linkage. A series of holes, usually three, are provided in a cam so that the length of the pump stroke can be varied according to ambient temperature. Less fuel is needed from the accelerator pump during warm weather than during cold weather. Consequently, the accelerator pump actuating linkage is placed in the hole which will give it the shortest stroke to compensate for summer driving. In cold weather operation, more fuel is called for from the accelerator pump so the actuating linkage is installed in the hole which will give it the longest stroke. If everything else checks out, but still the engine flattens out during acceleration, double-check to make sure the pump linkage is in the proper hole for that time of year. A short, summertime burst of gasoline can cause erratic engine operation during cold weather operation.

Clogged heat tubes which control the opening of the automatic choke are often overlooked during normal maintenance. A carbon-fouled heat tube can cause faulty choke operation with all its many forms of improper behavior. Poor gas mileage, stalling, flooding, and contaminated oil are all conditions which can be caused by a clogged heat tube.

There are replacement tubes on the market which can be used when the original equipment heat tube is clogged beyond repair. Some replacement kits include an entire new choke stove. Putting in whole units often solves the problem of a malfunctioning automatic choke.

TAILPIPE GIVES CLUE

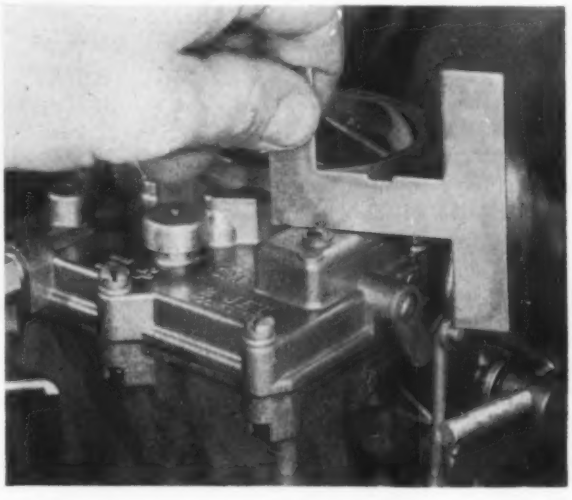
One very good spot to check the overall operation of the entire fuel control system is the outlet hole of the tailpipe. The kind of coating on the inside surface of the tailpipe is a dead giveaway as to the general condition of the combustion-induction area. For instance, if the tailpipe is coated with carbon deposits, either dry or moist, all is not well within the engine. A tailpipe coated with a deposit that is light grey in color indicates the combustion of the engine is about right.

If the carbon in the tailpipe is dry and flake-like, it usually means the carburetor is running too rich, or ignition timing is incorrect. If the carbon is moist and gummy, it is an indication that the engine piston rings are not properly controlling engine lubricating oil. It could also be that the valve guides are worn enough so that lubricating oil slips past them. Another possibility is a ruptured diaphragm on the fuel pump vacuum booster. At any rate, an oily tailpipe means that oil is getting back that far when it should be contained in the engine.

Another way to determine if the excess carbon in the tailpipe is caused by oil or gasoline is to accelerate the engine several times and watch the color of the exhaust smoke. Heavy black smoke is the result of too much gas. Smoke with a bluish cast indicates that lube oil is seeping into the exhaust system.

If the above tests confirm excessive gas being induced into the combustion chambers, look for high fuel pump pressure or a high float level in the carburetor. Incorrect ignition can possibly cause black smoke by not allowing the fuel-air charge to burn completely within the cylinder. In the case of an overly-retarded spark, the mix-

Length of the accelerator pump stroke is a key adjustment. On some carburetors, the stroke length can be varied according to climatic conditions—a short stroke for summer, long for winter.



ture is still burning when the exhaust valve opens. Actual flame can continue out of the cylinder and into the exhaust pipe. Sometimes it can go as far as the muffler itself. A muffler that runs unusually hot often is the result of retarded ignition timing.

RESTRICTED AIR INTAKE

Today's highly efficient air cleaners can be the cause of many poor mileage complaints, especially when cars are regularly operated under very dusty conditions. The dry-type air cleaner traps out and holds even the most minute particles of foreign matter. If the filter element isn't serviced regularly, the trapped dirt builds up into a thick coating which prevents the passage of clean air. In its most extreme form, clogged air filters can stop an engine from running. It's more common, however, to find filters that are partially clogged so that the engine can't get a deep breath of air, but it can get enough to run on. The result, of course, is high fuel consumption and loss of power.

A good visual inspection will generally uncover a dirty filter. Removing, cleaning and re-installing the paper element is no particular problem. It is a problem, though, to know exactly when the filter is offering excessive air restriction. Could be that the element looks clean and good, but is it? Maybe internal blockage is going unnoticed.

If this situation is suspected, it can be checked out fairly accurately by use of a combustion analyzer. To do this, hook up the tester, start the engine and allow it to reach normal operating temperature. With the engine at idle speed—off the fast idle cam—take a reading on the scale which indicates a relative analysis of the exhaust gases. Record the reading, and remove the air cleaner. With the cleaner off, take and record a second reading. If there is a differential of more than 5 to 7 per cent between the two readings, the air filter is offering excessive restriction and should be replaced.

If the combustion analyzer isn't calibrated in numbers so that you can compute a percentage differential, compare the reading taken with the engine operating with the old filter element installed in the air cleaner, to a reading taken with a replacement element installed. There should be enough visual differential between the original two readings to warrant a replacement element.

RESTRICTED EXHAUST

The problem of air restriction can be present on the exhaust end of the engine as well as on the intake end. Most often, restricted exhaust is present in the muffler and is termed excessive back-pressure. It isn't quite so easy to determine excessive back-pressure without the use of suitable testing equipment.

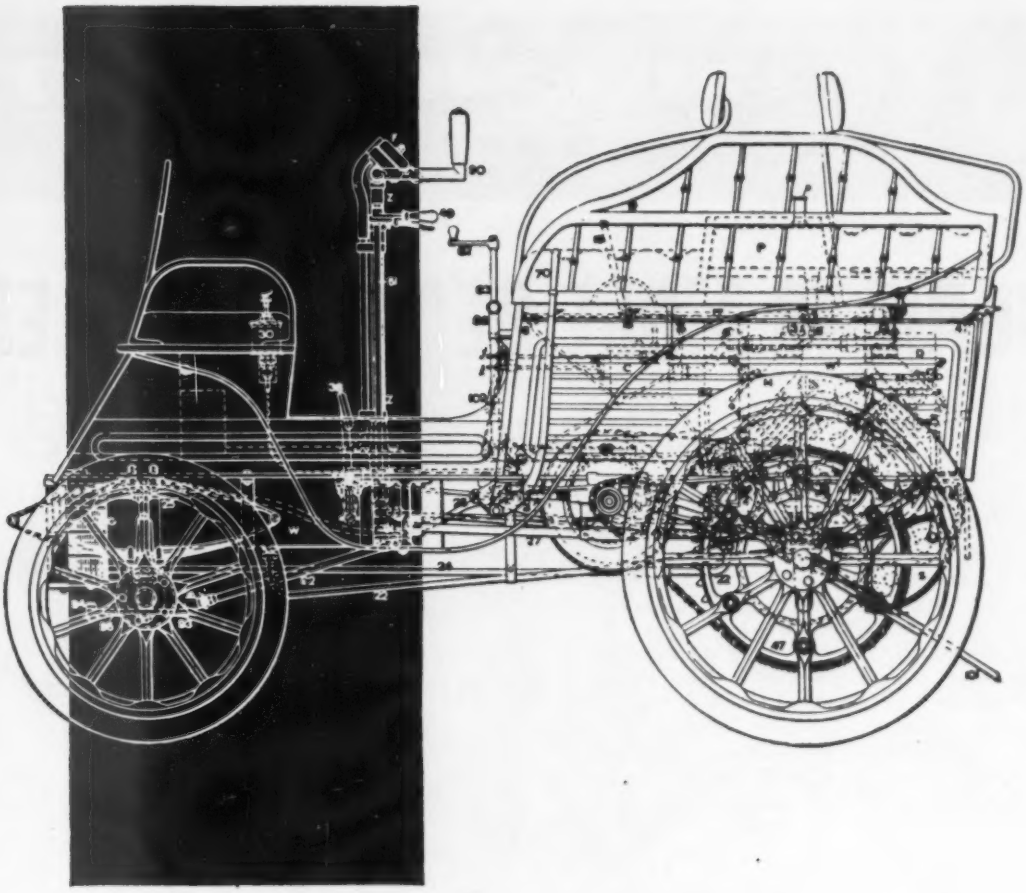
It is possible to get a fairly representative reading of

(*Continued on page* 73)

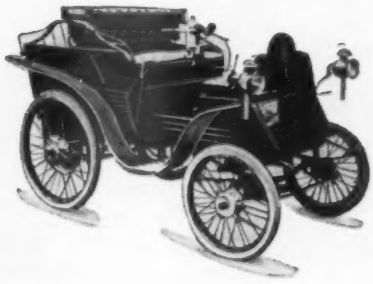
FUEL CONTROL SYSTEM TROUBLE-FINDER GUIDE

	Part
AIR CLEANER	
Dry type, clogged	I
Dry type, detecting damaged seal	V & VII
Oil bath type, Oil carry-over	V
Oil bath type, malfunctioning	I & V
CARBURETOR	**Part**
Heat tubes	VII
Jets Gummed	I
Linkage-gummed	I
Malfunctioning at transfer point	III
Pump circuit ball check seating	VII
Pump climatic control setting	VII
Pump system, flat spots	III & VII
Throat pressure	III
COMBUSTION	**Part**
Efficiency, checked with analyzer	VII
DETONATION	**Part**
Mechanical failure	II
Overheating, causes	II
EXHAUST SYSTEM	**Part**
Back pressure	I, VI & VII
Back pressure, reduction by resonators	VI
EXHAUST PIPE	**Part**
Drone, overcoming	VI
FUEL	**Part**
Condensation, trouble from	I
Level, high in carburetor	IV
Mixture, increasing speed of	V
Mixture, too lean	III
Mixture, too rich	III
Octane number requirements	II

	Part
FUEL PUMP	**Part**
Back pressure, remedy	IV
Diaphragm, ruptured	VII
Pressure, excessive, remedy	IV & VII
Pressure, insufficient	I
Pressure and volume	IV
Vacuum, insufficient	I
HEAT RISER VALVE	**Part**
Purpose, service procedures	I & VI
IGNITION	**Part**
Influence on carburetion	VII
MANIFOLD (Intake)	**Part**
Coking, remedy for	V
Excessive heat	V
Leaks, detecting	V
Torquing	V
MANIFOLD (Exhaust)	**Part**
Leaks, detecting	VI
Torquing	VI
MUFFLERS	**Part**
Failures, causes of	VI
POWER & ECONOMY	**Part**
Loss of	III
TAIL PIPE	**Part**
Tattle-tale of engine performance	VII
SEDIMENT BOWL	**Part**
Ice formation	I
VACUUM	**Part**
Pulsating, reasons for	V



one of the very few cars* you can't tune up with a Hygrade Jiffy Kit



You can tune up over 90% of all cars on the road with one economical assortment of Hygrade Jiffy Kits. Jiffy Kits contain needles and seats, gaskets, economizer valves, pump pistons, instructions and tools – to fit all carburetors: Carter, Stromberg, Ford, Holley, Rochester . . . and small engines, too! See your jobber or write HYGRADE PRODUCTS DIVISION, Standard Motor Products, Inc., Long Island City 1, New York.

A kit for almost every car

HYGRADE

Carburetor Tune-Up

JIFFY KITS

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*Sorry, no Jiffy Kit available for this 1899 Mors Four Cylinder Carriage

AC SELLING SLANTS

MONEY-MAKING FACTS

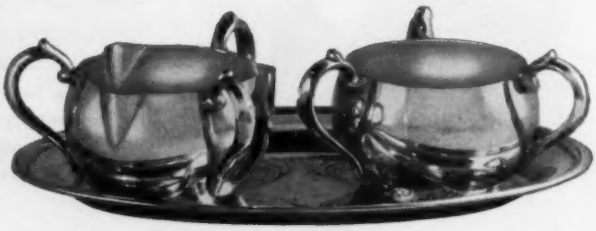
A GUIDE TO MORE HEADLAMP SALES

Offer your customers safety-aimed Guide T-3 Headlamps!

Famous Guide T-3 headlamp development made mechanical safety aiming possible. It's this kind of *Guide* leadership that assures you . . . and your customers . . . you're getting the best. *Guide T-3's* can be aimed without even turning on the lamps. The aiming pads of each lamp are precision ground for simple mechanical adjustment so that the upper and lower beams bring maximum benefits to the driver and to oncoming traffic. Offer to safety-aim the headlamps on your customers' cars. *Guide T-3's are original equipment on more new cars than any other brand!*

Give your wife this beautiful Oneida Silver Server Set!

There's something gracious about serving with silver . . . something that your wife knows about. That's why she'll more than appreciate this beautiful Oneida Silver Server Set. The Oneida sugar and creamer with matching tray is something new and different in fine silverplate. Each piece is plated with pure silver. The sugar bowl and cream pitcher are both lined with gold. The craftsmanship is the finest . . . by famous Oneida silversmiths.



You can get the Oneida Silver Server Set for your wife during AC's new Guide Headlamp Promotion. Here's How:

Include $8.25 with your order for any 16 Guide Headlamps and the GLM-52.

You'll receive the attractive Oneida Silver Server Set plus three additional Guide T-3 Headlamps, 2 #6012, 12-volt, and 1 #6006, 6-volt, worth $8.25.

When you have sold the extra headlamps, you have recovered $8.25. The profit from the sale of the extra lamps pays for the promotion package.

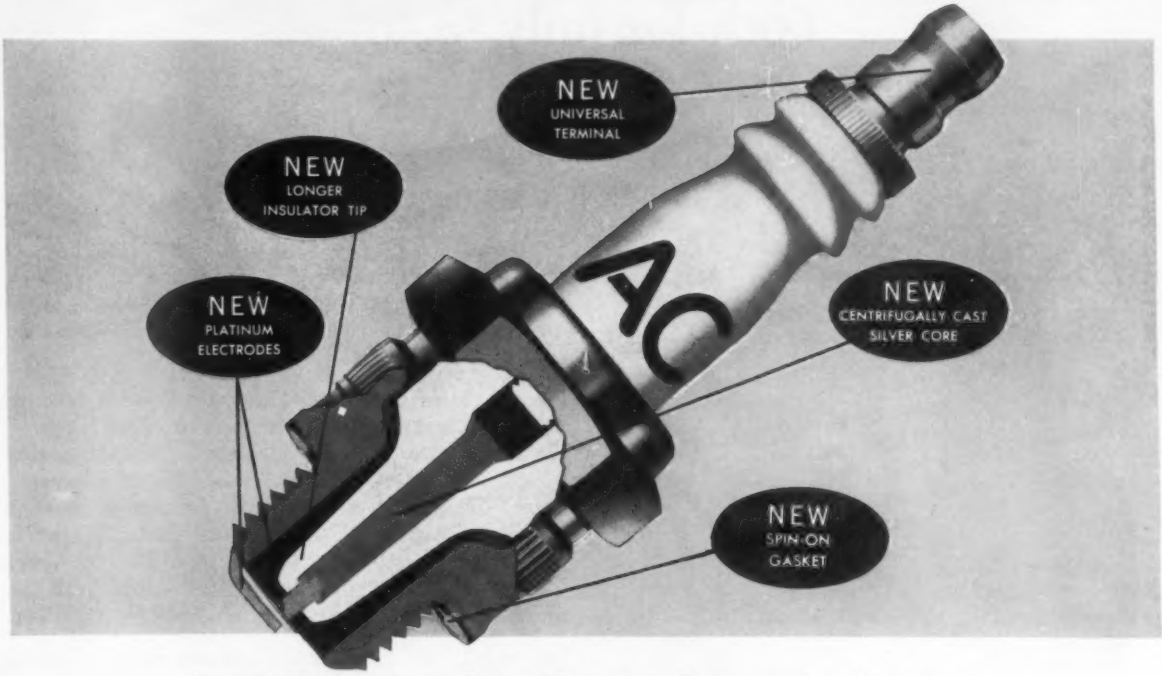
GET YOUR ONEIDA SET WITH THE GLM-52 GUIDE HEADLAMP PROMOTION!

AC SPARK PLUG ⚛ THE ELECTRONICS DIVISION OF GENERAL MOTORS

OF THE MONTH !

FOR DEALERS

OUTSTANDING NEWS ABOUT AC PLATINUM ELECTRODE SPARK PLUGS



Specially Designed for Extreme Power Applications
Cars—Trucks—Marine Engines—Commercial Engines

NEW Platinum Electrodes deliver peak performance throughout *longer service life!* The tremendous heat resistance of platinum reduces electrode wear, minimizes gap growth and gap bridging.

NEW Silver-filled Insulator Core provides more rapid heat dissipation and greater anti-fouling characteristics.

NEW Longer Insulator Tip ensures more powerful sparking even under sub-normal operating conditions of low voltage or weak coils. The thin, finer insulator tip provides higher heat conduction and less chance for electrical leakage—no pre-ignition!

NEW Spin-on Gasket allows for easy spark plug installation—no more fumbling with gaskets that fall off during installation!

NEW Universal Terminal designed to accept both common types of wiring clips.

AC Platinum Electrode Spark Plugs offer greater reliability than standard spark plugs, and require *less service.* They set new standards of performance. Here's aircraft quality and performance in an all-new line of AC Spark Plugs. Ask your regular AC supplier about new AC Platinum Electrode Spark Plugs today!

AC SPARK PLUG ❀ THE ELECTRONICS DIVISION OF GENERAL MOTORS

CALL YOUR AC SUPPLIER

AC SELLING SLANTS

MONEY-MAKING FACTS

A Special offer from AC

Get the New AC Service Wrench and AC Oil Filter

both for only $3.45!

With AC's new Service Wrench for disposable oil filters, there's no problem getting the filter from those hard-to-get-at places in new auto engines. The job's as easy as a turn of the wrist!

The torque of this new AC Service Wrench is sufficient to exceed normal requirements for filter removal. Manufactured by one of America's leading tool suppliers, the AC Service Wrench features a spring steel alloy grip—the positive friction grip—that will not crush the filter. This field-tested wrench is designed to operate in close quarters. Its short handle allows you to remove filters easily from the most complicated engines.

See for yourself. You can replace disposable oil filters in no time. Get the AC Service Wrench now during the new AC Oil Filter Promotion.

For only $3.45, you'll receive the new AC Service Wrench plus one popular PF-2 AC Oil Filter worth $3.45.

When you have sold the filter, you have recovered $3.45. The profit from the sale of the PF-2 element pays for the promotion package.

GET YOUR SPECIAL AC SERVICE WRENCH WITH THE OFM-51 OIL FILTER PROMOTION!

AC SPARK PLUG ❀ THE ELECTRONICS DIVISION OF GENERAL MOTORS

OF THE MONTH !

FOR DEALERS

Fleets change filters 2 to 4 times as often as cars

AC SELL-O-GRAM

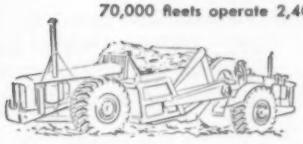
To All AC Jobbers, Dealers
Everywhere, U.S.A.

Now you can go after big-volume, fast-moving fleet filter business. Effective immediately, AC is introducing new line fleet-packed oil filters, specially packaged, priced for fast sales. Filters come in 24 popular types covering 85 percent fleet market. Both full-flow and partial flow types in sock and paper elements. Packed in 6, 12 and 24-unit cartons with filter and gasket individually wrapped in protective polyethylene. Big competitive advantage — you can offer local availability in standard carton lots. You order — give prompt delivery — as needed. Application information, catalogs, price schedules at regular AC Supplier. Order Now. Sell big to this big market.

E. H. Francois
General Sales Manager
AC Spark Plug Division

70,000 fleets operate 2,400,000 trucks

268,537 buses change filters on regular schedules



233,703 pieces of off-the-road machinery represent another big market

Order Now...Sell Big to this Big Market!

AC SELLING *SLANT* OF THE MONTH!

MONEY-MAKING FACTS FOR DEALERS

The profit from the sale of ONE AC AIR CLEANER

Here is the most useful blanket you've ever seen. Covered on one side with a soft nylon blanket and on the other side with a vinyl coated fabric, the "6 in 1" is both versatile and durable. The over-all length of the "6 in 1" is 60 inches, and it is 50 inches wide. Easy to clean? Just wipe the vinyl side with a damp cloth or hand-wash the entire blanket. It's waterproof!

And, it's as easy as selling Quality AC Air Cleaners to get one of these handy, all-weather "6 in 1" Blankets for your family. Here's all you do:

Include $6.33 with your order for any 6 new AC Air Cleaners and the ACM-53.

You'll receive the "6 in 1" Blanket plus one additional AC Air Cleaner (type A-85-C for Oldsmobile) worth $6.33.

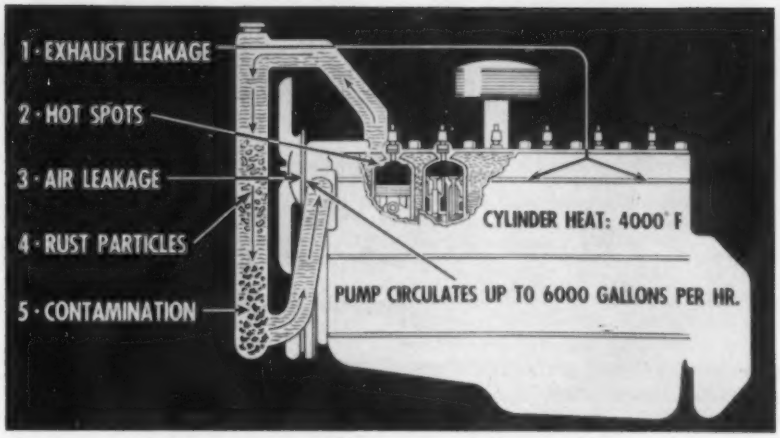
When you have sold the type A-85-C Air Cleaner, you have recovered $6.33. The profit from the sale of the extra air cleaner pays for the promotion package!

GET YOUR 6 IN 1 BLANKET WITH THE ACM-53 AIR CLEANER PROMOTION!

Rust—the radiator's enemy

• MODERN CARS DEMAND precise maintenance techniques. And no component of today's higher compression engine is better proof of this than the cooling system.

For example, in recent years many of the automobile manufacturers redesigned the radiator cores of their higher compression engines until, today, some radiator tubes are no more than 23/1000's of an inch in diameter. This is only as thick as the head of a pin.


1 · EXHAUST LEAKAGE
2 · HOT SPOTS
3 · AIR LEAKAGE
4 · RUST PARTICLES
5 · CONTAMINATION
CYLINDER HEAT: 4000° F
PUMP CIRCULATES UP TO 6000 GALLONS PER HR.

Five ways a rust inhibitor can break down due to chemical change. It is not practical to strengthen depleted inhibitors, because of chemical incompatibility.

QUICK TO CLOG

Obviously, any tube so minute can become quickly clogged and obstructed when there is rust, oil, muck and scale circulating through the cooling system. Yet, if those narrow passages are not allowing the coolant to flow freely through, the engine is apt to overheat. Power loss, increased fuel consumption, lubrication failure, warping of cylinder heads, scoring of blocks and piston rings, valve seizure, and eventual ruin of the entire engine, all can result. This is especially true during spring and summer when hot weather places an additional burden on neglected, rust-clogged cooling systems.

TUBES ARE PAPER THIN

The radiator tubes are designed to carry the liquid coolant from the radiator's top tank to the bottom tank. These tubes are encased within the radiator fins. The fins allow air to flow through the radiator grille and around the radiator tubes. Since the walls of radiator tubes are made of paper-thin metal, the air passing around them carries away heat and lowers the temperature of the cooling system fluid as it passes down to the bottom tank.

But let a neglected system's contaminated coolant circulate through these tiny tubes, and, in a short time, they are plugged with rust and scale deposits. Since the coolant cannot pass these obstructions to get to the lower tank, there is no chance for coolant temperature to be lowered. Thus, the coolant becomes hotter and hotter, and the cooling system is less and less effective in keeping the temperature of the engine in the range intended by the manufacturer for maximum operating efficiency.

The only way to prevent cooling system problems like this is to make sure that your customers' cars have fresh, effective rust and corrosion inhibitors in their liquid coolants at all times.

INHIBITORS NOT EVER-LASTING

Although good inhibitors are built into all-winter anti-freezes, this very fact can be a trap for the unthinking motorist. The manufacturers of these all-winter anti-freezes are careful to point out that the rust and corrosion inhibitors in their solutions don't last forever. The warning should be taken seriously. Without carefully controlled laboratory tests, it is impossible to tell the precise amount of effective protection remaining in these inhibitors after a winter's driving. For your customers' and your own reputation, you should take it for granted that a winter's driving has exhausted the anti-freeze inhibitors. Urge them to drain off winter-worn anti-freeze as warm weather arrives.

THOROUGH FLUSHING NEEDED

It's a good idea to remind them, too, of the need for a thorough flush of the cooling system at this time. This will remove most of the rust or scale that has already formed. Make sure they have not forgotten their annoyance with last spring's traffic jams; when cars with overheated engines were stalled on the road for hours at a time. Then, of course, when you refill radiators with fresh water, add a good rust inhibitor. Tell customers about the effectiveness of an inhibitor in cutting day to day operating expenses and eventual repair costs.

Never let your customers fool themselves by thinking that adding fresh inhibitors to old anti-freeze solutions will restore full protection. A fresh inhibitor won't remove rust and corrosion deposits that have already formed. This practice doesn't make any better sense than continually adding a fresh quart of oil to the crankcase instead of having a periodic oil change.

BONUS PROFITS

With summer vacation and travel time just ahead, the sales conscious shop operator will remind his customers of the maintenance techniques required to keep modern cars in top operating condition. Your customers look on you as the expert on their cars' needs. After a tough winter's driving they're in the right frame of mind to listen when you recommend thorough servicing of their cars' cooling systems. Also, once you are under the hood you can count on finding plenty of repair and replacemnt needs that have nothing to do with the cooling system. Records indicate that these bonus profits will be yours in over thirty per cent of the cars coming to you for cooling system work.

The service needs of today's cars give you a wonderful opportunity to show your customers the value of a careful preventive maintenance program. And remember, sell your customers on a before-hot-weather anti-freeze drain and cooling system flush. Then, you can count on seeing them back again when it's time to install anti-freeze in the fall.

Integral valve guide service

Out-of-round or bell-mouthed holes can be re-worked either by reaming for valves with oversize stems, or by reaming and pressing in thin-walled replaceable guides. In each case an alignment fixture is an essential piece of shop equipment for precision work.

●MODIFICATIONS AND CHANGES in engine design over the years to cope with higher operating temperatures as power output increased have been detailed and varied. Valves and valve operating mechanisms are examples, especially those in the V-8 engines.

Exhaust valve cooling always has been a major concern of engine designers. Some years back it was found that the exhaust valve ran cooler when a long guide was used; that is, the guide was carried closer to the valve head. It had the effect of protecting the valve stem from the hot gases going through the exhaust valve immediately as the latter was opened. The objection to such a long guide was the difficulty of lubrication. Consequently wear of the guide and valve stem was rapid.

Where exhaust valve sticking was a problem the condition was relieved or overcome by cutting off the projecting part of the guide flush with the guide boss. In many cases, too, the guide was partly counter-bored.

VALVES CAST IN HEAD

Several years ago the industry came out with engines having heads in which the valve guides are cast as part of the head. Such guides also are called integral guides, since they are not removable guides, as used in older model engines. Integral guides are actually only drilled and reamed holes in the head casting.

Cylinder heads with integral valve guides can be re-worked by either:

1. Reaming and installing oversize stem valves, or
2. Reaming and installing replaceable valve stem guides and thereby using standard sized valves.

If inspection shows the old valves are still servicable, it is more economical to install replaceable thin-wall valve guides.

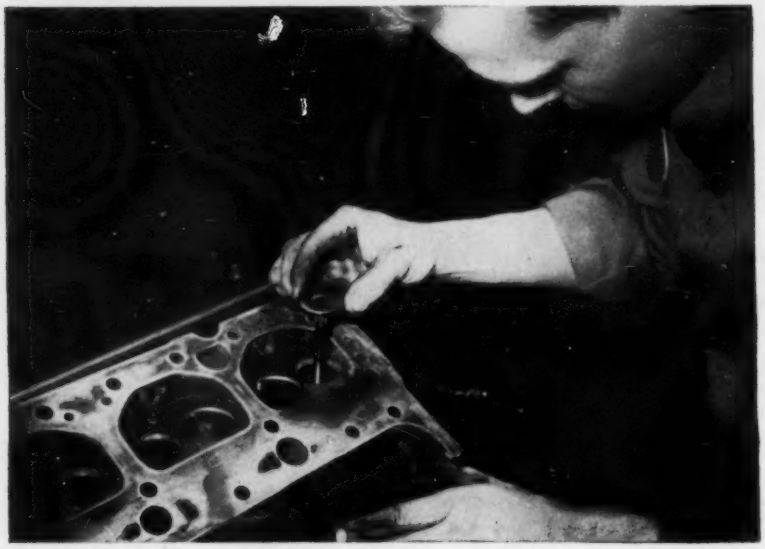
Either procedure is possible with equipment such as illustrated. Available from the maker of this equipment are roughing and finishing reamers, expanding pilots and replaceable valve stem guides. The G-Series guides are cast iron; GL-guides are a dense, longer wearing alloy metal. When the bell-mouth and out-of-round condition is pronounced, an alignment fixture must be used to guide the reamers. This is true whether the old guides are reamed for oversize stem valves, or for replaceable guides to use standard valves.

MANY COMBINATIONS AVAILABLE

Valve guide reaming sets are available in many combinations; a basic set including, for example, a swivel head, swivel ball, base, universal swivel, special washer, guide nut, hex wrench, aligning bushing and two reaming bushings, pilot-spanner and T-wrench and clamp rod.

To install replaceable valve guides

Cylinder head should be inspected for cracks. If head is OK, valve clearance in guides can be checked.



By PHIL LUNDY
Field Editor

we give here the procedure as performed in the shops of Southwest Chevrolet, Chicago. The cylinder heads to be reworked were from a 1955-V8 Chevrolet. The heads were in service for 80,000 miles. Both heads were first thoroughly cleaned and checked for cracks.

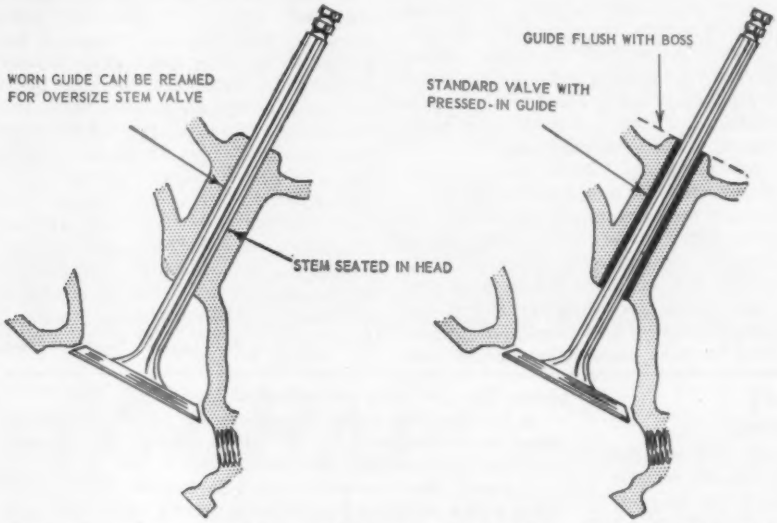
Left: Aligning guide assembly with original valve guide bore, using a Lee self-expanding pilot and aligning bushing. Right: After inserting bushing and reamer in guide assembly, original guide bore is rough and finished reamed, using a ½ in. drill.

SETTING UP THE JOB

The self-expanding pilot is placed in the pilot wrench and positioned in the valve guide hole. The wrench is then removed and the guide assembly mounted on the head with the clamp rod (this rod is threaded at both ends). It is essential to put the special washer under the top, and the two other washers on the bottom nut of this rod. The clamp rod is not firmly tightened, just finger-tight.

Next, two screws on the swivel unit are loosened and the pilot-aligning bushing installed in the universal ball. This assembly is placed over the pilot. The guide unit assembly is now moved around so the clamp rod can be aligned to the stud hole. The nuts on the clamp rod are finger-tightened until the guide unit base is firmly seated on the cylinder head. Then the two screws on the swivel are tightened, while the universal ball is tightened with the spanner wrench. This operation may have to be done once or twice more, to be sure of reamer guide accuracy.

When precision alignment prevails the pilot aligning bushing should slip up and down easily. Then, the clamp rod is locked into place. With the guide unit in this position both operations—guide reaming and replaceable valve stem guide installation—can be done. Therefore, the pilot and pilot-aligning bushing can be removed.


WORN GUIDE CAN BE REAMED FOR OVERSIZE STEM VALVE
STEM SEATED IN HEAD
GUIDE FLUSH WITH BOSS
STANDARD VALVE WITH PRESSED-IN GUIDE

Tools are available to install oversize valves or replaceable valve guides in engines which have guides cast as part of the head.

For reaming the bolts to receive the guide, a ½" electric drill and drive adapter are needed. A drill speed of approximately 400 r.p.m. is generally recommended. The first operation is rough reaming, followed with a high speed finishing reamer. After that the thin-walled guide is pressed into place (from top of head) with an arbor press.

INSTALLING OVERSIZE STEM VALVE

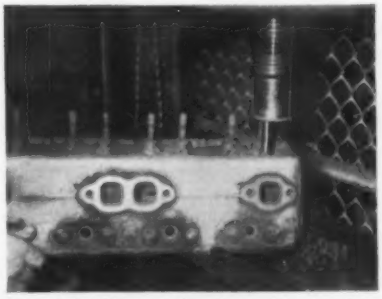
For oversize stem valve installation the hole of the integral guide is cleaned with a solid valve guide reamer. Next, the self-expanding pilot is positioned with the pilot wrench. All swivels of the reamer guide assembly are loosened and the pilot-aligning bushing is installed in the universal ball. From here on the alignment of the reamer guide assembly follows the procedure previously given for installing replaceable valve guides.

Reaming of the guide can be accomplished with a T-wrench for hand operation, or with a power drive (115 or 230-volt universal motor) available from the manufacturer of the guide reaming sets.

REASON FOR INTEGRAL GUIDE

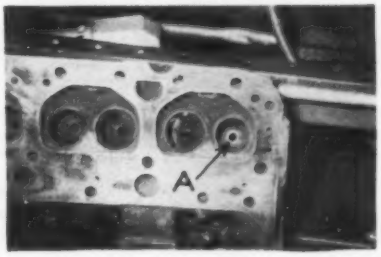
In passing it might be said that while elimination of valve stem guides in V-8 engine heads does make for simplification, that is not the prime reason behind the design. Better cooling of the valve stems due to more rapid heat transfer to the coolant is the reason.

With the integral guide heat is



Pressing thin-walled valve guide in place with an arbor press.

Bottom of cylinder head, showing at "A" replaceable valve stem guide.



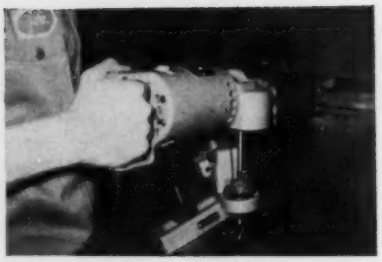
When installing oversize stem valves, a T-wrench can be used for hand operation.

passed directly from the valve stem through the head casting metal into the coolant. With the use of a pressed-in valve stem guide, the heat must travel first from the stem through the metal of the guide, then through the metal of the head and finally into the coolant. It is generally accepted that heat flows more easily through one solid homogeneous metal than through two dissimilar, or even similar metals in contact with each other. With integral valve stem guides it also is held that stem scoring is prevented and wear reduced to a minimum as long as ample lubrication exists between the stem and guide.

In defense of installing thin-walled replaceable valve stem guides in properly reamed holes of integral guides, it can be said that ample cooling of valves still should follow. For one thing, the metal surrounding the hole of the integral guide is reduced in thickness, which with the wall thickness of the pressed-in guide makes the original distance from stem to coolant substantially the same as the original construction.

It is perhaps true that the contact between the head metal and guide, in effect, produces a "heat dam" and may partially affect heat flow to coolant. However, it also is true that a fairly well worn integral guide, top and bottom, allows only partial heat flow from the middle portion of the guide. Hence, it would follow that well-fitted replacement guides with standard valves can meet the requirements of good overall engine operation and insure adequate cooling of valves. Field practice has substantiated this.

The advent of integral guides brought up some points in connection with maintenance procedures for engines so equipped. On the one hand, reaming the integral guides calls for replacement of valves with oversize stems. On the other hand reaming the guides and pressing in thin-walled replacement guides allows the use of standard valves with standard size stems. This also works out to advantage on the first valve grind job, for example, where the original valves may be good enough for further use.



A power drive is adaptable as a power unit for reaming operations.

As is well known by the shopman, the holes of valve stem guides wear out-of-round or bell-mouthed at the top and bottom of the holes. As a rule little or no wear occurs in the middle portion of the holes. This means, then, that oversize stem valves cannot be used. The holes must be reamed to a definite oversize and above all, align-reamed with the valve seats. This is especially true if the holes are considerably worn, top and bottom. If the holes are in fairly good shape it may be possible, with care, to ream them in satisfactory alignment with the valve seats by using special oversize reamers. However, the safest procedure is to use an alignment fixture, especially since its use is simple and fast. It is the safest insurance against possible come-back jobs and restores conditions that allow full attainment of the performance which characterizes modern OHV engines.

Figs. 1, 2, 3, 4, 5, 7, courtesy, Southwest Chevrolet, Chicago, Ill.

Choke Piston and Link Assembly Possible Cause of Engine Stalling

Engine stalling immediately after a cold start on 1959 Chrysler and Imperial models has been blamed on the choke piston and link allowing the choke blade to open too wide immediately after a cold start.

According to a recent factory service bulletin, this has been corrected on late production Carter AFB-2797S carburetors, with the units identifiable by a spot of white paint on the left front corner of the carburetor flange, or by an "A" preceding the date code and carburetor model number, stamped on the right front corner of the flange.

On early production carburetors which do not incorporate the change, the factory recommends that the choke piston and link assembly be replaced, following the procedure outlined below:

1. Remove the choke cylinder welsh plug located on the front of the carburetor by driving inward with a centerpunch until the plug is loose.
2. Carefully remove the cotter pin which connects the choke piston link to the choke blade. As an added precaution to prevent dropping the cotter pin into the carburetor, hold the choke blade closed while removing the cotter pin.
3. Remove the choke piston and link assembly and thoroughly clean the piston bore of all deposits and foreign material.
4. Install the new choke link and piston assembly (Carter Part No. 160-204-S). This assembly can be identified by the absence of a groove around the O.D. of the piston. The late style piston has no groove.
5. Holding the choke blade closed, attach the choke piston and link assembly by choke blade, using a new cotter pin (Carter Part No. 106-19).
6. Install the new welsh plug (Carter Part No. 47-30), using a flat ended punch, driving gently until the plug is flat.
7. Start and warm up the engine, then adjust idle mixture and speed.

Willys Announces "Maverick Special"

The "Maverick Special" 2-wheel drive station wagon is designed for standard 6-passenger family service and as a carry-all capable of handling 100 cu. ft. of cargo. This latest "Jeep" wagon is powered by the Willys 4-cylinder, F-head "Hurricane" engine, available with optional overdrive. "Captive Air" tires eliminate need of carrying a spare, and the 104.5" wheelbase permits easy maneuverability. Overall length is 176"; width 72".

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Servicing the Fiat

General knowledge of the design, observance of necessary clearances, tolerances and torquing specifications opens the door for custom or general maintenance applicable to this small import motor car.

• FINE ITALIAN CRAFTSMANSHIP — which takes a back seat to nobody when it comes to building—is well represented in the automotive field by Fabbrica Italiana Automobili Torina, Fiat to the less linguistic. With its sales jumping from below $50 million in 1946 to above $560 million in 1957, the firm is moving up fast on Volkswagen and Renault in the small car realm.

Fiat sales in this country put it right up among the leading import car registrations.

All this adds up to a need for service know-how on the part of the American knuckle-skinner. Fiats are here to stay apparently. Time's come to face up to the little rascals. Properly armed with pertinent service poop, a good mechanic can learn to love the Fiats—and enjoy a profitable business keeping them scampering.

MANY MODELS

Fiat uses the number system—500, 600, 1100, and 1200—to identify its four series. The 1200 is the top luxury line and, except for size, resembles a conventional American sedan. At the other end of the series, the 500 is a peanut, which can be compared only to other imported peanuts with tricycle landing gear. Rear engines characterize the tiny numbers; while the larger have under-the-hood engines.

By HERB CARRIER
Detroit Editor

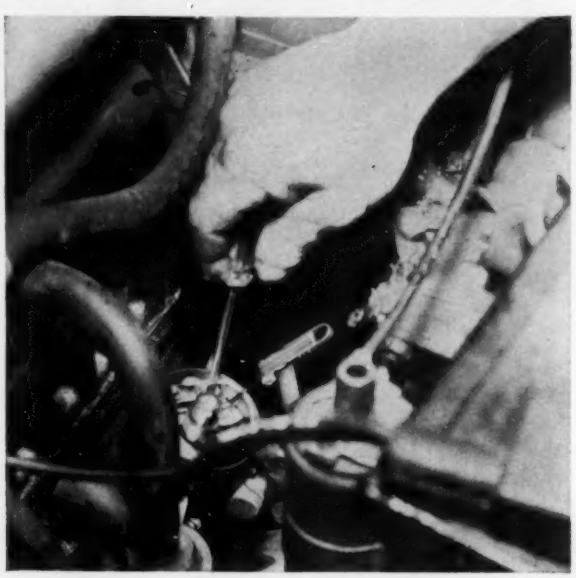
Of the 12 available models in the Fiat line, the 600's and 1100's will serve to represent the servicing requirements.

THE FIAT 600

Two popular styles are available in the 600 series: a 4-passenger Sedan and the "Multipla," which is a station-wagon type vehicle. Despite some individual differences between the two, general specifications apply across-the-board. Both use 4-cylinder, in-line engines with 7.5:1 compression ratio and maximum horse-power rating of 22 at 4600 r.p.m.; conventional battery ignition; water cooling and overhead valves.

Four speed gear boxes are standard equipment; but no automatics are available.

Cylinder blocks are cast-iron and integral with the crankcase. Heads are aluminum, with cast-iron valve seat inserts. The intake manifold is actually part of the cylinder head. Three cast iron rings: a



Rear-engine Fiats are easiest to service, but under-the-hood models offer no undue problems. Low fenders permit jobs like this distributor-point adjustment without difficulty.

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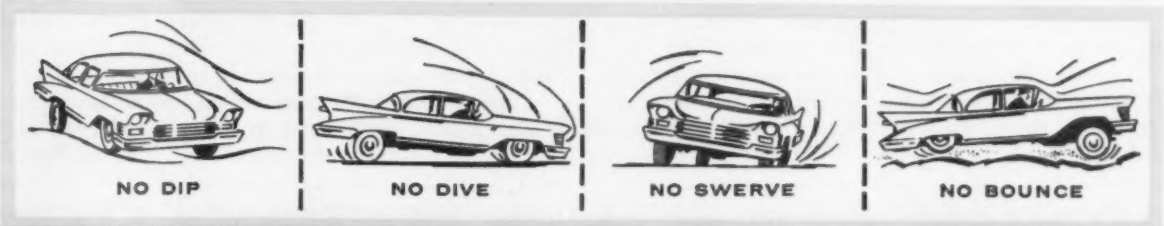

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Start now to cash in on the big-profit market for shocks. Check every car on your lift or over your pit. A leaky shock is defective and means a sale is waiting to be made. Installing a new set of Golden Glide shocks is simple—no special tools are needed. Just an hour of your time earns you a profit of more than $15! Your Golden Glide jobber can give you full details. Call him today.

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THE GOLDEN GLIDE SHOCK ABSORBER CO.

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compression, a compression-scraper and an oil scraper, are used on the aluminum-alloy pistons.

Fuel is delivered by a mechanical, diaphragm-type fuel pump, which is mounted on the engine and driven by the camshaft through a fuel pump push-rod. Standard carburetor is a Weber 22 IM downdraft. The carburetor air intake is equipped with an air cleaner and silencer. A unique warm air intake is used, which allows the operator to admit warm air from the passenger compartment to the engine during cold weather operation. This set-up consists of a mechanically controlled shutter between the engine compartment and the luggage space behind the rear seat.

Another unique system of controlling the temperature of the incoming air is found in the design of the dry type air cleaner. The pleated paper element fits in a sheet metal body and is held in position by a metal cover, which is slotted and can be rotated around its mounting pin. In warm weather operation, the cover is positioned so that air enters the engine through the upper slots. For cold weather operation, the cover can be rotated so that warm air from around the engine's exhaust manifold is drawn through the air cleaner and into the engine.

Colored tabs—red and green—on the cover body facilitate correct positioning. In summer, the cover retainer wing nut is loosened and the cover rotated until the green lug faces upward. In winter, the cover is rotated 180° so that the red lug faces upward.

The filtering element is serviced in the same manner as American-built dry-type elements. That is, dust removal every 3,000 miles (more often in unusually dusty operation), and replacement every 6,000 miles. To clean, the element is removed from its body and lightly tapped against a firm surface. Careful use of compressed air is all right, if line pressure is low enough so as not to tear the paper.

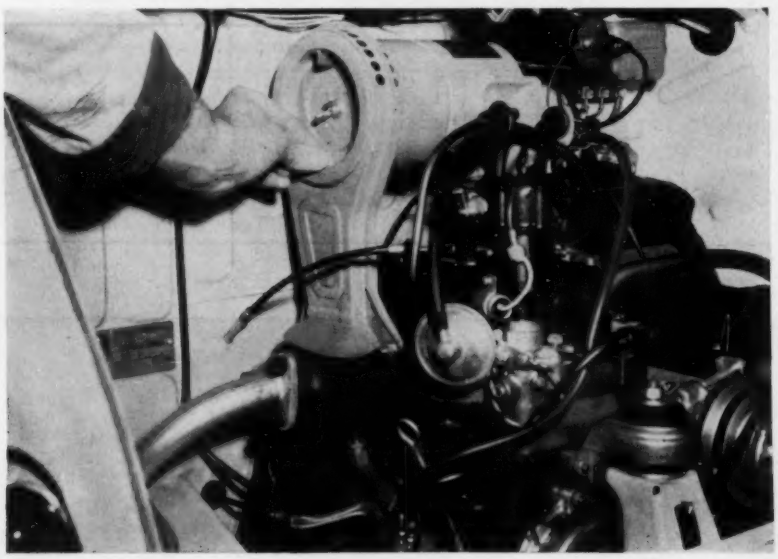
An oil bath air cleaner is used on special applications. Again, the slotted cover technique, whereby the incoming air temperature can be controlled to suit climatic conditions, is employed. The oil reservoir is attached to the main body by two snap fasteners. To check or add oil, merely unsnap the fasteners and remove the reservoir. Every 3,000 miles oil should be changed, and the entire cleaner assembly, including the wire mesh, thoroughly washed with kerosene.

CHARGING SYSTEM

The Fiat uses a 12 volt electrical system. The generator is rated at a maximum continuous output of 180 watts; maximum steady current output of 13 amps. The generator cuts in at approximately 1300 to 1380 r.p.m., and reaches its maximum output at 2250 to 2400 r.p.m. The generator is a 2-pole type, and uses a separate voltage regulator. Shunt field windings are employed, consequently, the generator should never be operated with the two external leads connected.

The generator regulator consists of the standard three units: voltage regulator, current regulator, and cut-out relay. All units are mounted on a common frame to form a single, compact assembly. Terminals for the units are marked by numbers, as are the generator terminals. Proper connection involves only matching the numbers. For example, number 51 is the terminal for the generator positive lead. Number 67 is the terminal for the generator negative lead. Number 30 is the terminal for ammeter connection.

Again, terminals 51 and 67 should never be con-



Revolving cover of Fiat air cleaner assembly provides means for directing warm or cool air through the carburetor. Two colored tabs indicate positions that govern use of cool air from the top of the engine compartment, or air preheated by the exhaust manifold. Wing-nut locks cover.

GENERAL FIAT SPECIFICATIONS

	1100 Sedan	600 Sedan	600 "Multipla"
ENGINE	4-cyl. in-line OHV	4-cyl. in-line OHV	4-cyl. in-line OHV
Bore and stroke	2.68" X 2.95"	2.36" X 2.20"	2.36" X 2.20"
Displacement	65.5 cu. in.	38.63 cu. in.	38.63 cu. in.
Compression ratio	7:1	7.5:1	7.5:1
Max. horsepower	43 at 4800 r.p.m.	22 at 4600 r.p.m.	22 at 4600 r.p.m.
ELECTRICAL SYSTEM	12 volt	12 volt	12 volt
IGNITION	Conventional battery	Conventional battery	Conventional battery
COOLING SYSTEM	Water	Water	Water
CARBURETOR	Solex C 32 PBIC	Weber 22 IM	Weber 22 IM
FUEL CAPACITY	9.0 gallons	7.13 gallons	7.6 gallons
FUEL CONSUMPTION	29.4 m.p.g.	41.25 m.p.g.	35.21 m.p.g.
BRAKES	4-wheel hydraulic	4-wheel hydraulic	4-wheel hydraulic
WHEELBASE	92.13"	78.75"	78.75"
TRACK			
Front	48.60"	45.30"	48.42"
Rear	47.85"	45.67"	45.55"
EST. MAX. SPEEDS			
1st gear	19 m.p.h.	15.5 m.p.h.	12.5 m.p.h.
2nd gear	31 m.p.h.	25.0 m.p.h.	22.0 m.p.h.
3rd gear	47 m.p.h.	40.3 m.p.h.	39.0 m.p.h.
4th gear	75 m.p.h.	59.0 m.p.h.	56.0 m.p.h.

nected together. Nor should the terminals be interchanged on the regulator posts. If number 51 terminal is connected to number 67 post, and vice-versa, the regulator would continue to function, but would soon fail completely. This is because current supplied by the generator would flow from generator terminal (51) to regulator terminal (67) through the voltage and current regulator contact points.

As generator output increases, the voltage regulator points—or the current regulator points, depending upon battery state of charge and demands upon the system—will open. Proper operation calls for the points to close under these conditions. If the points are open a heavy arcing will occur at the contact points. Also, the regulator will work at reduced efficiency until the contact points actually weld together, or the generator field windings burn. Even though the connections are only reversed for a short time, the damage caused will ultimately affect the operation of either the regulator or the generator.

Most vibrating-type regulators suffer the same type of malfunctioning if terminal connections are incorrect. It's always good practice to double-check all generator-regulator terminal connections before the battery terminals are connected.

IGNITION SYSTEM

The entire battery ignition system of the Fiat is conventional in design. The primary circuit consists of the battery, the breaker assembly, condenser, and primary winding of the ignition coil. The secondary circuit consists of the secondary coil windings, distributor rotor, distributor cap, high tension ignition cables, and the spark plugs.

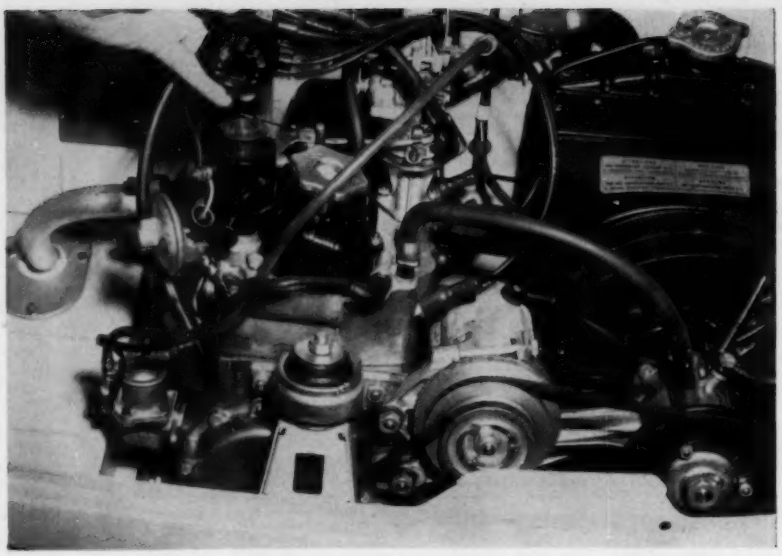
The distributor includes both centrifugal and vacuum advance units. Each unit operates in standard fashion. The vacuum advance diaphragm is somewhat unusual in appearance, but its function in the system is identical to diaphragms in American-built vehicles. Distributor point gap is .016" to .019".

Ignition timing marks are located on the timing gear cover and the crankshaft pulley. Initial ignition timing calls for 10° static advance. This means that the 10° mark on the crankshaft pulley must line up with the reference mark on the timing gear cover when the engine is idling and the marks are viewed with a timing light. The advance specifications are figured in addition to the initial 10° advance.

To make the initial setting, merely loosen the distributor hold-down collar and rotate the distributor body as necessary. Then tighten down the collar.

BULB-TYPE HEADLAMPS

The 600 Sedan and the Multipla both use headlamps with replaceable bulbs. To replace a burned out bulb on the Sedan, loosen the lower lock screw and pull the frame bottom edge outward and slightly downward. Remove the assembly only a few inches to gain working clearance. Tip the frame downward and lift the spring which secures the bulb holder to the reflector. Remove the bulb holder. The bulb is attached to the holder with a bayonet coup-



Rear-engine Fiat is highly accessible. Note here, the unusual design of the distributor rotor. Two wire bales hold distributor cap.

ling. Remove and replace the bulb, and re-install the headlamp assembly.

On the Multipla, pry off the frame with a screwdriver. The frame is held in position by simple spring clips. Press the headlamp frame inward slightly and turn it about 15° in a counterclockwise direction. Then remove the assembly and replace the bulb in the same manner as for the Sedan.

Caution: Fiat headlamp reflectors are aluminized. During bulb replacement, never touch the reflective surface with fingers. If the reflector is dusty, clean it with compressed air or a soft feather duster. Never use a wiping cloth as this will ruin the aluminized coating.

THE 1100 SEDAN

The 1100 model also uses a 4-cylinder, in-line engine with overhead valves. It has a bore of 2.68" and a stroke of 2.95". Total displacement is 65.5 cu. in. The compression ratio is 7:1, and the engine develops 43 horsepower at 4800 r.p.m. Engine output is checked without the air cleaner and without the fan. Under these conditions, the maximum torque output is 52.4 ft. lbs. at 3200 r.p.m.

Like the other Fiat passenger cars, the 1100 uses a cast-iron crankcase, and an aluminum cylinder head with cast-iron valve inserts. The crankshaft is steel and has three main bearings.

The overhead valves are operated by the engine camshaft through a timing chain. Standard pushrods and rocker arms are used. Tappet clearance is .0145", during valve timing only. The intake valves open 16° B.T.D.C. They close 56° A.B.D.C. The exhaust valves open 56° B.B.D.C., and close 16° A.T.D.C.

After timing, the final valve clearance adjustment should be .0039" with the engine cold. This is on both intake and exhaust valves. The letter "A" is stamped on the head of the intake valves for identification purposes. The intake and exhaust valves differ in both appearance and construction material.

The 1100 series is equipped with the Solex carburetor, type C-32-PBIC, conventional in design and construction. There are the basic float, idle, main, and accelerator circuits. An idle adjustment screw and an idle mixture adjustment screw are used to control the idle circuit. A needle and seat are used to control the fuel level in the float circuit; a jet to control the main circuit; an accelerator pump and discharge valve to control the accelerator circuit.

An engine-driven diaphragm-type fuel pump delivers fuel from the gas tank to the carburetor fuel reservoir.

IGNITION

Battery ignition is used on the 1100 series as it is on the other Fiat models. The static advance on the 1100 is 0°. The automatic advance (maximum) is 30°. The distributor is driven by the engine cam shaft. Standard-type breaker point assemblies are employed. Ignition timing marks are also located on the timing gear cover and the crankshaft pully. Standard or power timing lights will work satisfactorily on any Fiat automotive engine.

FIAT SUSPENSION

The front suspension on the 1100 consists of pressed sheet steel swinging arms, individual coil springs, and hydraulic shock absorbers. The shocks are fitted with progressive-action compression valves to improve the vehicle's riding qualities over all normal driving conditions. A transverse stabilizer bar ties the two independent front suspension units together, and gives the 1100 remarkably good roadability.

The rear suspension employs conventional leaf springs and hydraulic shock absorbers. A stabilizer

WHEEL ALIGNING NEWS

STEERING John BEAN SERVICE The PRECISION of the STARS

Add Wheel Aligning Service for Less Than $350

The trend toward heavier cars and more costly tires has made proper wheel care more important than ever. Well aware of the need for periodic checkups, drivers are turning more and more to their service stations to fill the need.

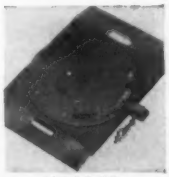
For many years, only the larger operators were willing and able to invest in the necessary equipment. But today, thanks to low-cost portable tools and a far greater demand, wheel aligning service is now a practical and profitable investment for most stations.

The trouble is that many operators still are unaware of two important facts: (1) the potential profits that await them in the wheel aligning business, and (2) the fact that it doesn't take a lot of money and training to get started.

A good example is the portable John Bean equipment shown here. First, for checking camber and caster, you can select either the self-calculating mechanical gauge No. 52 or the Model 50 magnetic gauge. Either one gives fast, accurate readings, is adaptable to light trucks or cars, and costs less than $75. Combining one of these with the Model 51 toe-in scribe gauge gives you all the checking tools required. In addition, you'll want a good set of turntables, preferably of the ball bearing type illustrated here. These can be placed at the front of your grease rack runways or set right on the floor if you prefer. A pair costs less than $100. Add to all this a basic set of correction tools for slightly more than $120, and you're in the wheel aligning business for less than $350 . . . a total investment that is quickly returned in profits.

Model 52
Mechanical Gauge

Model 50
Magnetic Gauge



Model 60
Turntables

Model 51 Toe-In Scribe Gauge

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John Bean now offers a new Visualette "package" that employs beam-of-light projection for speed and accuracy in wheel aligning, yet requires no pit . . . no bolting of equipment to the floor. Your present hoist — whether drive-on or frame contact type — positions the car on portable wheel stands that require adjustment for car level the first time only.

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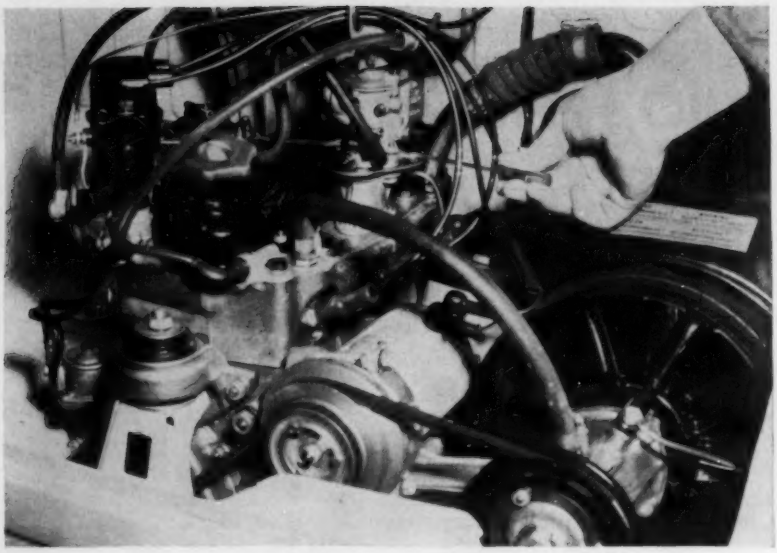


Carburetor has conventional idle and mixture screws, spring-loaded to assure permanent adjustment. Note the dish-type drip tray located between carburetor and engine —a safety feature to prevent gasoline dripping on head.

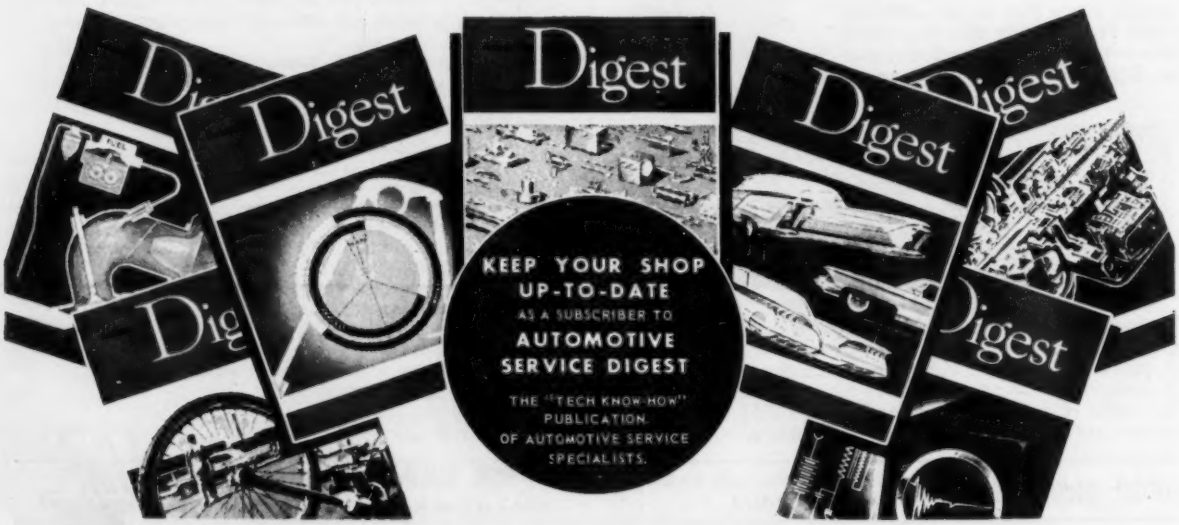
bar is also used on the rear suspension.

On the 600, upper swinging arms are used on the front suspension in conjunction with a transverse leaf spring. The spring also acts as a stabilizer bar. Kingpins are common to both systems.

BRAKES

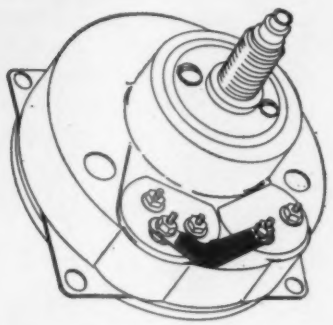
Fiat uses internal-expanding hydraulic brakes on all four wheels. The parking brakes are mechanically operated. On the 1100, an adjusting cam nut extends through the backing plate to provide a means of brake adjustment. To adjust this type brake, raise the side of the vehicle on which the adjustment is to be made. Depress the brake pedal. While holding the brake pedal down with a suitable locking tool, turn the adjustment cam nuts outward until they reach their stops. Then back off the nuts about 20° on used linings, or 25° on new linings. Release the pedal and check to see that the wheel rotates freely.

All in all, Fiat vehicles should pose no particular service problem to a qualified mechanic. The models most popular in this country are very conventional in design. Only the tools and specifications are new. Even on the rear engine models the engine, power train, and suspension assemblies are much like the American counterparts.



Willys Instrument Cluster Has Jumper Link Sleeve

The instrument cluster used on Willys vehicles has been improved by the addition of an insulating sleeve on the jumper link. The jumper link is installed on the back of the cluster between the temperature gauge and



heat indicator terminals. The insulating sleeve prevents the possibility of the jumper link shorting out against the instrument case, and resulting gauge failures. The new sleeve is being installed on all current production vehicles.

Willys suggests that all vehicles should be checked for the presence of this insulating sleeve. On vehicles not equipped with the sleeve, it is recommended that the jumper link be removed and wrapped with plastic electric tape to within one half inch of each end. When reinstalling the jumper link, make sure its curved end is installed on the fuel gauge terminal.

Correcting Detonation on Ford V-8 Interceptors

Should it be necessary for a car owner to use fuel of insufficient octane in the 1958 Ford, 332 cu.in. V-8, thus causing excessive detonation, Ford recommends that the timing be retarded to 2° BTDC. If detonation still exists, the distributor should be recalibrated as follows:

Dist. r.p.m.	Vac. in. hg.	Advance°
575	——	*
800	——	3-4
1050	——	5½-6½
2000	——	10½-11½
——	6	0-3
——	10	5-8
——	14	9-12
——	Max.	12½

Set initial timing at 3° BTDC for conventional transmissions, 6° BTDC for automatic transmissions. If the fuel is really poor (or owner insists on burning distillate) retard timing to 2°—but no further—with all transmissions.

With the 352 cu.in. Interceptors (T-Bird Special) using mechanical valve tappets, distributors can be set to the following limits for fuels *below* 96 octane (research rating).

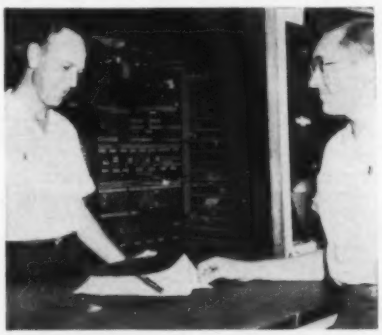
Dist. r.p.m.	Vac. in. hg.	Advance°
425	——	0
500	——	½-1½
700	——	4½-5½
1000	——	7½-8½
2000	——	13½-14¾
——	8	1-3¾
——	11	4½-7½
——	14	7-10
——	Max.	12½

Timing of 3° for manual shift and 6° BTDC for automatic transmission is recommended. In no case, however, should timing be retarded beyond 2° BTDC.

Hold on to That Paper

It's pretty aggravating when an important paper blows onto a dirty floor or out the window.

A windshield wiper blade and arm assembly bolted to the desk or counter



will prevent such trouble. The bolt takes the place of the windshield wiper shaft. And the windshield wiper assembly can be swung right or left to hold the paper securely—yet release the paper readily.

Don't Guess About Polarity . . . Make This Simple Test

Most cars and trucks today use *negative* ground systems, but a lot of the older equipment is still wired the other way around. Therefore, when installing batteries, be especially careful to install them with the correct connection grounded. This is especially important in cars equipped with the new transistor radios which require negative ground.

Here's how to check the polarity in case of doubt. Before starting the engine, connect a voltmeter from the regulator "B" terminal to ground. For negative-ground systems, ground the voltmeter negative lead. The needle will swing *up* if polarity is correct.

Regardless of the vehicle's system, remember that the secondary (high tension) ignition system should still supply negative voltage to the spark plug terminals. This reduces the amount of voltage required by the plugs, and can give ignition system up to a third more "reserve."

To check ignition polarity, ground the positive lead of your voltmeter and, with the engine running, momentarily touch the spark plug terminal. If the needle swings up-scale, polarity is correct.

Torque-Flite Dipstick Improved on '59 Chryslers

On the 1959 Chrysler and Imperial models, a new transmission fluid level indicator (dipstick) is used with an improved method for indicating the proper transmission fluid level. The new dipstick markings consist of the marks "Add One Pint" and "Full."

When checking fluid level on refilling a Torque-Flite transmission, the correct transmission fluid level is as follows:

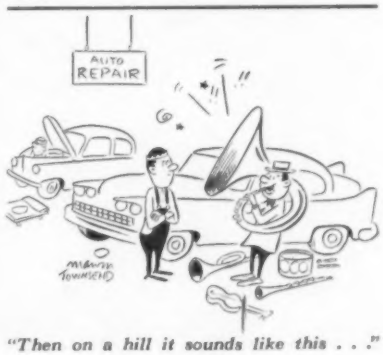
Transmission *hot*, engine idling in neutral: Fluid level should be between the "Full" mark and the "Add One Pint" mark. Fluid should be added or removed to bring the level between these two marks.

Transmission *cold* (below 100° F), engine idling in neutral: Fluid level should be between the "Add One Pint" mark and a point ½" below the "Add One Pint" mark. Fluid should be added or removed to bring the level between these two positions.

Removing Ball Check Restores Performance

Occasional power loss with Ford 1957-'58 truck engines (272, 302 and early production 332) using four-barrel carburetors can be caused by improper opening of secondary throttle plates.

The Ford Service Department states that a sticking ball check in the carburetor secondary diaphragm housing may be the source of the trouble, and recommends that this ball check be removed to restore normal performance.



"Then on a hill it sounds like this . . ."

Replacing the quarter panel

• THE QUARTER PANEL wasn't so severely damaged that it couldn't have been straightened. But the labor cost to do so was about equal to the price of a new panel. So it was decided to make replacement rather than repair, on the '55 station wagon.

In handling this common type of body job, the Chevrolet dealer shop put to use many of the principles and methods that come out of the understanding of body-part installation methods. To begin with, the quarter panel supplied by the factory includes the rear window frame; while the damage suffered by this customer's car was only on the lower and rear portions. Since much time and work would have been required to remove the glass and cut through the pillars at each end of the panel, the body men used only part of the replacement unit.

"TAILORING" THE WORK

Using an air-powered chisel, they cut away the damaged panel along the lower edge of the window, the edge of the door frame and the rear edge of the inner panel. Next the replacement panel was cut to correspond, leaving a lap of approximately 3/4-in. at the top and the front end. Once trimmed, the new quarter-panel was put into position to check the fit.

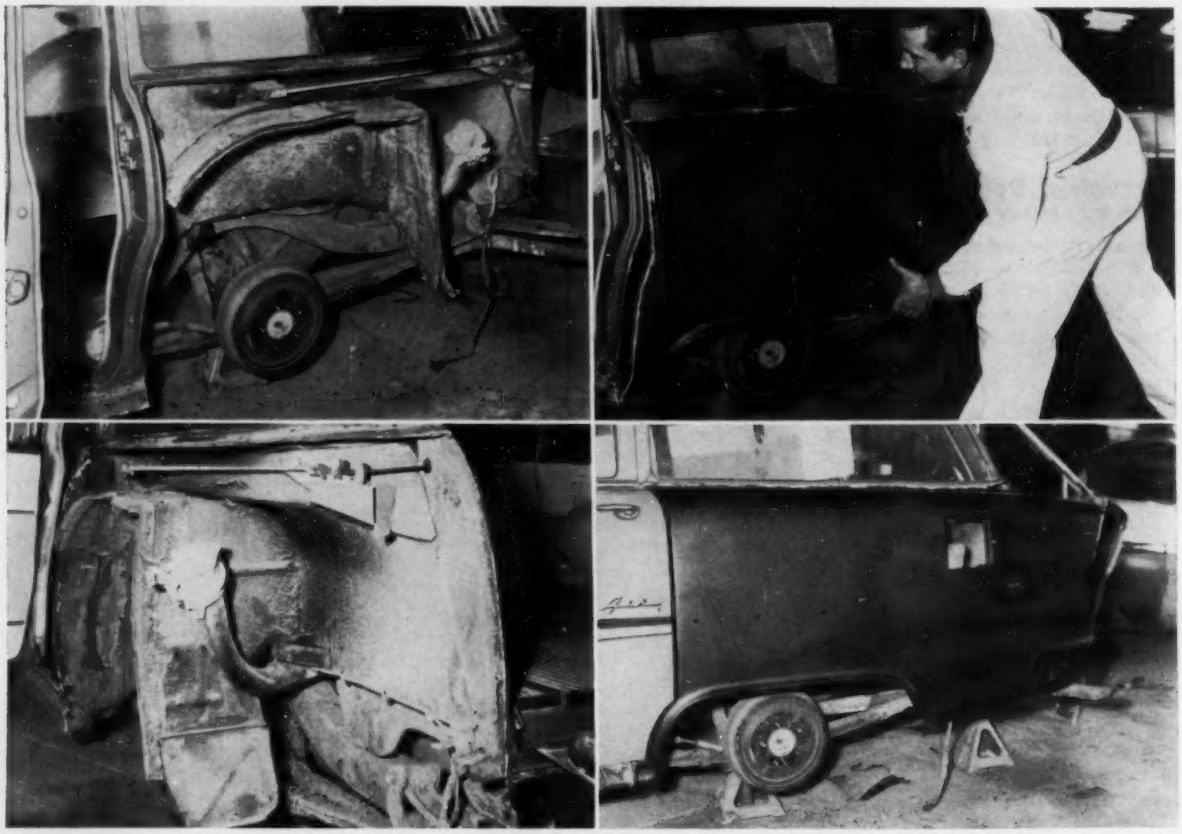
When the fit was found satisfactory, the replacement was tacked into place; then spot welded every inch to inch-and-one-quarter along the top and front edges. Welding was done in spots rather than along the full length to avoid possible distortion and buckling from the heat.

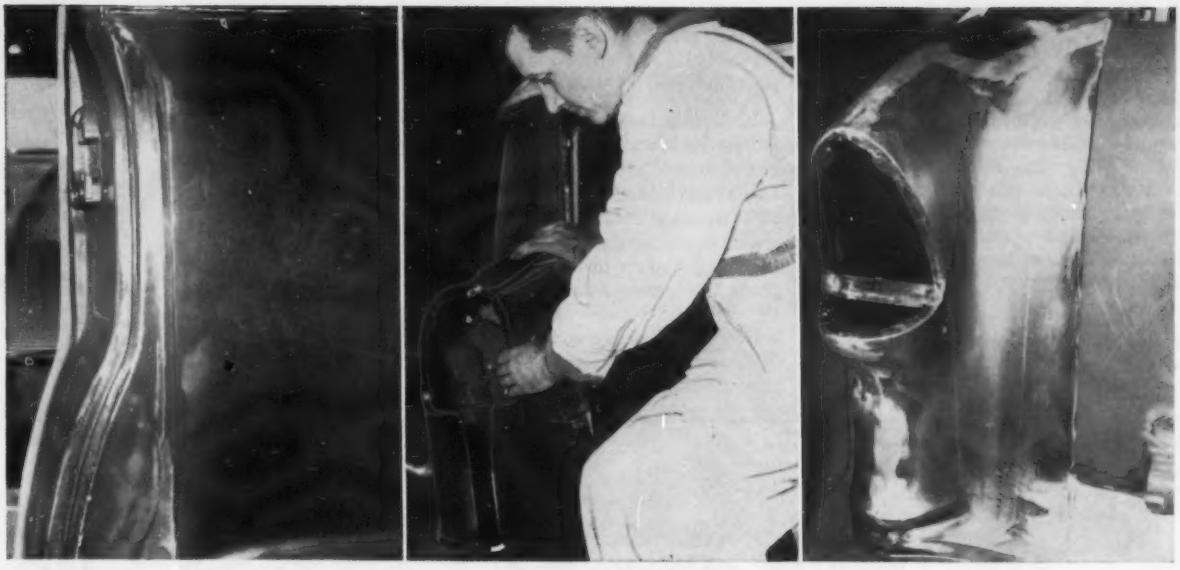
"HIDING THE EVIDENCE"

At the front end, the joint was brazed along the full length. It could have been leaded after tack welding; but brazing made a stronger joint, and took no more time than would have been needed to tin the surface and apply the lead. To get a smooth surface, the brazed joint was ground down with a disc sander.

Of course, this front joint is concealed when the car door is closed. At the top edge of the replacement panel, the tack welding is hidden when the trim molding is put back in position.

Left, top and bottom: left rear corner after damaged panel was cut away. Below: replacement fitted and tacked into position.





Above left: detail of the door pillar after replacement panel has been brazed at the front end. Note how joint is offset and will be covered by the closed door. Center: positioning the extension panel preparatory to tacking and welding it into place. Right: the finished joint between the extension and the quarter panel after welding and leading operations are completed.

ADDING THE EXTENSION

At the rear of the quarter panel, another replacement was required: the quarter-panel extension, which is also linked to the inner panel at the location shown in cut (2). This was next put in place and spot welded to both the quarter panel and the inner panel.

These joints were ground down flush with the disc sander. Next they were leaded, followed by a second grinding-down to provide a suitable surface for painting. With all the "heavy" work out of the way, the body men were ready for another key step in returning the car's appearance to "good as new." All the new metal was primed and painted. This done, only minor mechanical work remained to complete the job.

The tail light was now replaced, and the trim restored to its position. Then the rear bumper was remounted. The body repair was finished, and the station wagon looked—and actually was—as good as before the collision.

As with most body work, this job could have been done in any of a number of ways. This particular operation is a good illustration of following good practices in finding the quickest and simplest methods to a thoroughly satisfactory result.

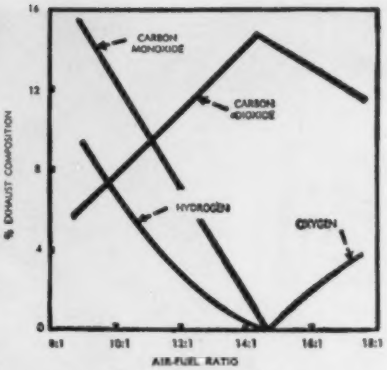
Replacing the bumper is the final step. Panel painted and trim back in place, the station wagon is ready to roll out of the shop looking "good as new."

Exhaust Gas Analyzers Need Analyzing, Too!

When was the last time you had your shop's exhaust gas analyzer checked or calibrated? In its latest issue of "Service Tips," Champion Spark Plug Co. reminds mechanics that an exhaust gas analysis can only be as accurate as the instrument and the man who operates it. Here are some of their suggestions on the use of the analyzer.

1. Be sure the exhaust system is tight before attempting to make an analysis. You can't get an accurate reading when air is leaking into the exhaust system through a bad muffler or tail pipe. Also check carburetor flange bolts and carburetor linkage for possible leaks.

2. Unless the manual which accompanies your analyzer indicates differently, do not attempt to measure air/fuel ratios leaner than 14:1. Champion cites the case of an analyzer which insisted upon swinging "rich" on a car that was known to be lean. The explanation is shown in the accompanying graph. Notice that at slightly above 14:1 hydrogen in the exhaust disappears and oxygen becomes a product of combustion. Carbon diox-



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ELECTRIC 5U-HD IMPACTOOL

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Call your I-R Jobber today for details and prices on the most complete line of Air and Electric Impactools for automotive service.

The smartest way to reduce labor costs and build your service business overnight.

ide also shows a sharp break in its percentage curve at the same point. This chemical phenomenon throws any analyzer off the beam and can produce false readings.

3. Exhaust analyzers are generally quite accurate up to a reading as high as 14:1, however. This covers all normal carburetor mixtures which most mechanics are likely to encounter. According to Champion, their engineers find the analyzer useful both in pinpointing carburetion trouble and in improving fuel economy where no actual trouble exists. In the first category a late opening power valve in the carburetor often causes excessively lean mixture at high power, contributing to detonation, burned valves and burned spark plugs. Power valve operation, however, can be checked quite easily either on a dynamometer or on a road test by using the exhaust analyzer in conjunction with a vacuum gauge. This gives you an opportunity to see just when the power valve cuts in for comparison with manufacturer's recommendations.

To obtain maximum economy, the analyzer is an essential tool for establishing optimum air/fuel ratios at part throttle, constant speed driving; the range which has probably the greatest effect on overall economy.

An exhaust gas analyzer can be a tremendous selling tool, too. For customers who may be skeptical about paying for a tune-up because "it seems to be running fine," they can soon learn a lot about the efficiency of their engine when you show them the reading on the analyzer. An excessively rich mixture often caused by a combination of ignition and carburetion problems can cost motorists many times the price of a tune-up in a few months.

Say You Saw It In
Automotive Service Digest

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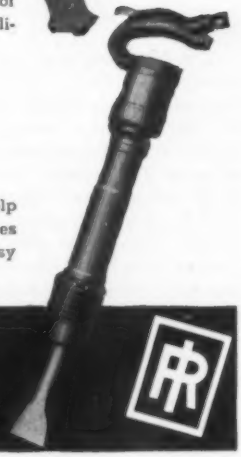

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The Solex carburetor

Carburetor work also requires that mechanics be thoroughly familiar with the units being used on the foreign cars now so popular in this country. Although nomenclature may be somewhat different, functions of the parts are very similar to the corresponding parts of our familiar, domestic carburetors.

By GUY F. WETZEL
Technical Editor

• THE SOLEX CARBURETOR is used on the Volkswagen, Porsche, Volvo, some models of the Jaguar, and several other imported cars. It is a relatively simple carburetor and is furnished in the single barrel model.

Practice with the imported cars seems to be to use more than one carburetor, rather than two or four barrel units as done on American cars. The foreign cars, in general being powered by very small engines compared with the very high powered American cars, can use the single barrel units satisfactorily. While relatively small in size, the carburetors supply ample air-fuel mixture to the engines.

SAME PRINCIPAL

Similar in principal to the conventional American carburetors, the Solex has the four basic fuel systems: (1) idle system, (2) main fuel system, (3) accelerating system, and (4) power fuel system. It is the downdraft type, with nomenclature a little different from American practice. Fig. 1 shows a cross section of carburetor.

IDLE SYSTEM

The idle system or idle circuit supplies a suitable air-fuel mixture when engine speed is too low to have sufficient air velocity through the carburetor venturi to actuate the main fuel system. This system depends on the high vacuum under the throttle plate, and it is at this point that the idle system discharges its fuel. The pilot jet (8, Fig. 1), the idle mixture adjusting screw (12, Fig. 1) and the pilot jet aid bleed (7, Fig. 1), combine to supply the correct mixture for the idle and low speed range.

The rich mixture supplied from the idle system discharge port is mixed with the air flowing past the slightly opened throttle valve to give a mix-

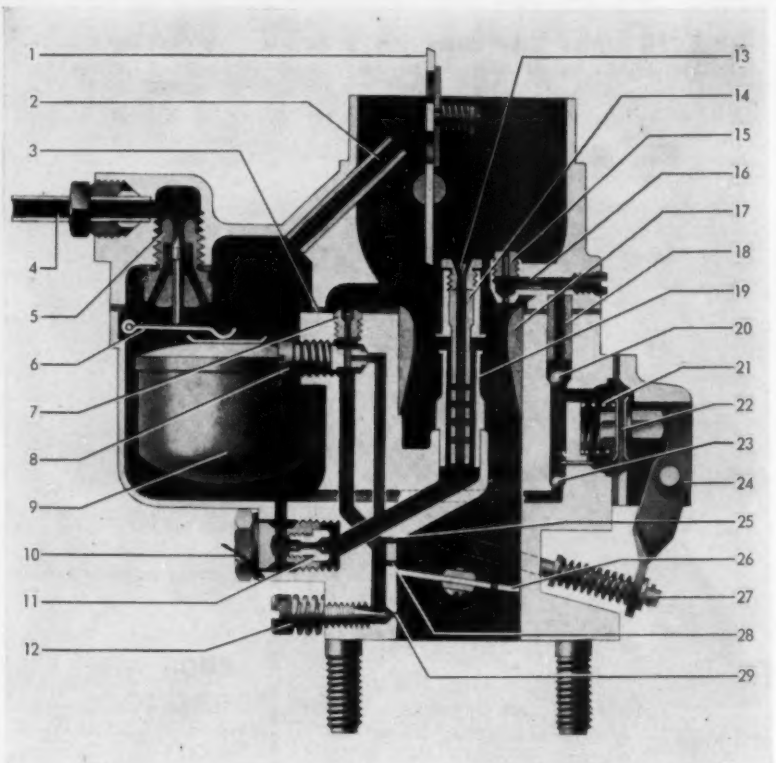


Fig. 1. Cross section of the Solex 28 PC 1 carburetor:

1-Choke valve	11-Main jet	21-Diaphragm spring (pump)
2-Vent tube	12-Mixture adjusting screw	22-Diaphragm (pump)
3-Gasket	13-Air correction jet	23-Lower ball check valve
4-Fuel line	14-Emulsion tube	24-Pump lever
5-Float needle valve	15-Air correction jet (pump)	25-Idle air bleed passage
6-Needle valve lever	16-Pump jet	26-Throttle valve
7-Pilot jet air bleed	17-Venturi	27-Throttle valve link
8-Pilot jet	18-Fitting tube	28-Accelerator port
9-Float	19-Spraying well	29-Idle port
10-Main jet carrier	20-Upper ball check valve	

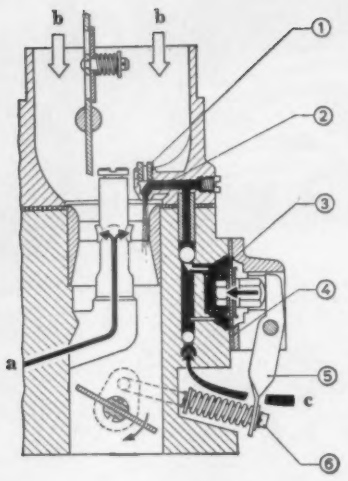


Fig. 2. Accelerating circuit of Solex carburetor:
a-Fuel from main jet
b-Primary air
c-Fuel from float bowl
1-Pump discharge nozzle and air correction jet
2-Pump jet
3-Diaphragm spring
4-Diaphragm
5-Pump lever
6-Throttle valve link

ture of the correct consistency. The flow of fuel is regulated by the volume control screw (12, Fig. 1). Turning in this screw weakens or leans out the mixture.

To insure smooth take-over or transition from the idling range to the part-load range, two accelerating ports (28, Fig. 1) are provided in the throat, a little above the throttle valve. As the throttle is opened wider, the depression in pressure, or vacuum above the throttle valve, increases and additional fuel is drawn from these orifices. A little above these ports is an idle air bleed passage (25, Fig. 1), the purpose of which is to lean out the mixture when the throttle is snapped shut. This prevents engine stalling.

MAIN FUEL SYSTEM

The carburetor float bowl is supplied with fuel by the engine driven fuel pump. The float and needle assembly keeps a constant level of fuel in the float bowl. As fuel is withdrawn from the float bowl, the plastic float drops, allowing the gravity operated float needle valve to drop, aided by the pressure of the fuel from the fuel pump. The needle and seat assembly is a one piece type, with the needle permanently fixed in the seat housing. If trouble should develop at this point the assembly is replaced.

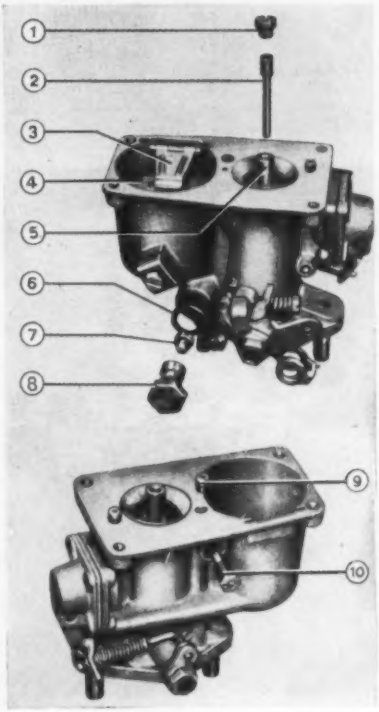
As the needle drops, fuel supplied by the pump enters the float bowl, raising the float and reducing or shutting off the fuel supply. This action maintains a constant fuel level.

With normal operation (part load), fuel from the float bowl flows through the main jet into the mixing or spraying well (19, Fig. 1) and is discharged through radial outlet holes by the partial vacuum created in the venturi (or choke tube as it is sometimes called by foreign service men). This fuel is then mixed with air drawn in through the carburetor throat. The vacuum (or depressed pressure) in the venturi is a function of engine speed and throttle opening. As the fuel discharge is approximately proportional to the venturi vacuum, the proper air-fuel mixture is maintained to suit the speed and load conditions.

As the throttle is opened wider the fuel level in the mixing well decreases (flow is limited by the size of the main jet) and air is drawn in through the air correction jet (13, Fig. 1). This air passes through the holes in the emulsion tube (14, Fig. 1), where a "premixing" process takes place with the fuel drawn from the main jet. This rich fuel-air mixture then passes through the discharge holes in the throat of the venturi where it is mixed with the air drawn in through the carburetor throat (primary air) to

Fig. 3. Dissembled views of Solex carburetor:

1-Air correction jet	6-Gasket
2-Emulsion tube	7-Main jet
3-Float toggle lever	8-Main jet carrier
4-Float	9-Pilot jet air bleed
5-Spraying well	10-Pilot jet



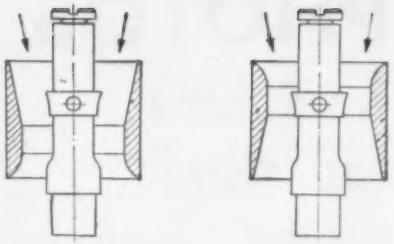


Fig. 4. When reassembling carburetor the venturi must be correctly positioned, as shown at right.

form a combustible mixture of the correct richness. Jet and venturi sizes are combined in such a way that the correct fuel-air ratio is maintained throughout the speed range.

ACCELERATING SYSTEM

As is the case with the American carburetors, an accelerating system is needed to smooth out the transition from operation on the idle system to operation on the main power system. For this purpose a diaphragm type accelerating pump is built into the carburetor, as shown in Fig. 2. The spring loaded diaphragm is linked to the throttle. When the throttle valve closes, the diaphragm is pushed back by the spring, and fuel is drawn into the suction chamber from the float bowl through the lower ball check. When the throttle is opened, the pump diaphragm is pushed back, and fuel is discharged through the upper ball check through the pump jet (2, Fig. 2) and on out through the discharge nozzle into the venturi.

The fuel supplied by the accelerating pump prevents "flat spots" and insures instantaneous pick-up when the throttle valve is opened suddenly. The pump chamber fills up only when the throttle is near the fully closed point. This arrangement is just about as simple as it can be made, and works very satisfactorily.

POWER SYSTEM

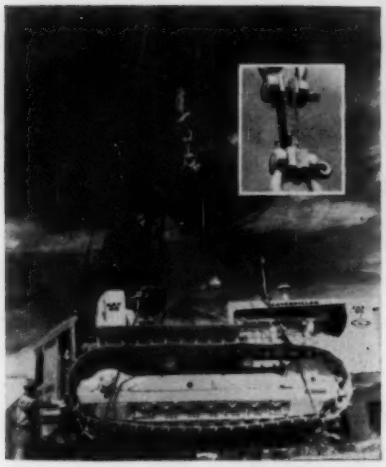
The Solex carburetor also follows American practice in supplying a power system to supply the correct mixture for higher speeds and/or heavier loads. In the higher speed ranges at wider throttle openings, the accelerating pump system also serves as a power system. Under these conditions, additional fuel is supplied through the pump discharge nozzle.

ADJUSTMENTS

The carburetor is set correctly at the factory and should not be tampered with. A correctly adjusting idling

(Continued on page 60)

PHOTOS from here and there



NOT DONE WITH MIRRORS (left)—Twenty-two ton tractor hangs aloft on three steel plates (inset) bonded together with a half-ounce of two-part chemical adhesive. Manufactured for the aircraft and missile field by Narmco Resins & Coatings Co., the "super-strong" bonding agent is headed for general industrial use.

DONE TO MIRROR-LIKE GLOSS—Electric buffing operations (above) at Pontiac Motor Division's refinish plant give high luster to durable Magic-Mirror acrylic lacquer as the '59's emerge from three-stage bake ovens. During drying by infrared lamps, conveyors take each car through 228 feet of oven in 10 minutes.

"FEET" TO MATCH MUSCLES—The world's largest dump truck, "Eucnick," dwarfs a group of visitors to the Oahe Dam site near Pierre, S. D. Fifth from the right is Raymond C. Firestone, president of The Firestone Tire & Rubber Co., manufacturer of the giant earthmover tires on which the truck rolls at speeds up to 35 m.p.h. Load capacity of the truck is 165 tons. Its trailer bed rises higher than a four-story building in dumping a load.

HARNESS FOR HORSEPOWER—While we've switched from horse to automobile, the need for a harness is still with us. Today, though, we use wiring harnesses like the one shown here to "hitch" electrical energy to its job. This particular harness carries electricity to 67 different front end locations on a modern car. It's undergoing a 76-point electronic test in the Ford company's Quality Control Center.

DIESELS POWER NEW FLEET—One of the 74 new Kenworth Model T-522 trucks with which Southern-Plaza Express has entirely replaced its former equipment. The Kenworths feature Cab-Beside-Engine design, are powered by Cummins diesels and are being operated with an entirely new fleet of 40-foot semi-trailers.

ROADWORTHY REPLICA — Patterned after the "horseless carriages" of bygone times, this ⅝-scale model is in production by Swift Manufacturing Company. It has been approved by California's Motor Vehicle Department and can be licensed for highway use, the firm reports. Three models are available, with three-horsepower, four-cycle engines, top speed of 30 miles per hour.

ANYONE FOR ROADSIDE TV? From the aircraft-missile field, by Magnetic Amplifiers, Inc., comes the "black box" shown on the table at right in this pleasant scene. As adapted to popular use, it converts auto battery current to 115-V, 60-cycle AC—permitting the motorist to operate a portable TV, stereophonic hi-fi, etc. by plugging into the cigarette lighter receptacle on the car dashboard.

MORE INFORMATION IS YOURS FOR THE ASKING

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ADVERTISERS IN THIS ISSUE

Advertiser	Key Number
A.C.F. INDUSTRIES, INC., CARTER CARBURETOR DIVISION	100
AC SPARK PLUG DIVISION	101
BARRETT EQUIPMENT CO.	102
BEAN DIVISION, JOHN	103
BOSCH CORP., ROBERT	104
CHAMPION SPARK PLUG CO.	105
CHRYSLER MOTOR PARTS DIV.	106
EIS AUTOMOTIVE CORP.	107
ELECTRIC AUTO-LITE CO., THE	108
FELT PRODUCTS MFG. CO.	109
GABRIEL COMPANY	110
GOLDEN GLIDE SHOCK ABSORBER CO.	111
GRAYMILLS CORP.	112
HAMILTON HOTEL	113
HASTINGS MFG. CO.	114
HOUSER ENGINEERING & MFG., INC.	115
INGERSOLL-RAND CO.	116
INLAND MFG. CO.	117
KEDMAN COMPANY	118
LEE COMPANY, K.O.	119
MAGNAFLUX CORP.	120
MASTER TECHNICAL PRESS	121
MILWAUKEE ELECTRIC TOOL CORP.	122
NATIONAL BRAKE BLOCK CO.	123
PAUL MARSH CO.	124
PERFECT CIRCLE CORP.	125
PERMATEX COMPANY, INC.	126
RAMSEY CORPORATION	127
RICH MANUFACTURING CO.	128
SEALED POWER CORP.	129
SNAP-ON TOOLS CORP.	130
SNAP-ON TOOLS CORP.	131
STANDARD MOTOR PRODUCTS	132
STRASSER, A.	133
STURTEVANT COMPANY, P.A.	134
SUNNEN PRODUCTS CO.	135
WAGNER ELECTRIC CORP.	136
WINONA TOOL MFG. CO.	137

"TECH KNOW-HOW" FEATURES

• ONLY ASD provides the automotive service field with timely, authoritative, detailed articles of this type. Prepared by men who have the actual experience, as well as the education to "live with" the increasingly specialized service needs of the modern automobile, these features go deeply into the methods and mechanical parts involved. Most "Tech Know-How" write-ups are step-by-step "how-to" descriptions of the latest procedures in a key servicing operation.

"BUSINESS KNOW-HOW" FEATURES

• COVERING the "dollar sign" side of our readers' information needs, ASD "Business Know-How" articles present management subjects from the specific automotive service shop viewpoint. They are written for owners and supervisory personnel by authors of recognized business-management ability; and are based on the actual day-to-day problems of a going automotive service establishment.

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Be sure, too, to study every issue of ASD . . . keep your information up to date. Shop operators who are "too busy" to read for what's new and better, can be "cured" of that condition by competitors who take the time to look for and act on, information about the most modern tools of the service trade.

EDITORIAL REVIEWS										
1	9	17	25	33	41	49	57	65	73	81
2	10	18	26	34	42	50	58	66	74	82
3	11	19	27	35	43	51	59	67	75	83
4	12	20	28	36	44	52	60	68	76	84
5	13	21	29	37	45	53	61	69	77	85
6	14	22	30	38	46	54	62	70	78	86
7	15	23	31	39	47	55	63	71	79	87
8	16	24	32	40	48	56	64	72	80	88

ADVERTISEMENTS							
100	108	116	124	132	140	148	156
101	109	117	125	133	141	149	157
102	110	118	126	134	142	150	158
103	111	119	127	135	143	151	159
104	112	120	128	136	144	152	160
105	113	121	129	137	145	153	161
106	114	122	130	138	146	154	162
107	115	123	131	139	147	155	163

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THROUGH THE PAGES OF ASD . . .

. . . the most alert and searching eyes in automotive servicing pass carefully every month. Make sure that your own are equally "in the know"!

You owe it to yourself to keep pace with fast-moving technical developments in the field. AUTOMOTIVE SERVICE DIGEST, "Know-How" and Know-What" publication of your trade, can keep you "out of debt" on what's new.

Better maintenance and repair techniques pour out of engineering labs as regularly as new designs roll off production lines. Knowing and using the new "wrinkles" means better shop work—and more business coming in the door.

Information and instruction to turn that trick are yours in every issue of ASD. It talks shop language in authenticated and accurate "how-to" feature articles, which fit up-to-the-minute approved procedures to shop working specs. It goes into on-the-job points of practice as deeply as the mechanic himself must . . . and is unrivaled for thorough coverage of "live" shop technology.

You need ASD to keep fully informed —and get your fair share of the benefits from technical advances. USE THE CONVENIENT POSTPAID CARD ABOVE TO ENTER OR EXTEND YOUR SUBSCRIPTION—TODAY.

Instrument corner

Conducted by The Instrument Man in the interests of simpler, faster, more satisfactory—and more profitable—service operations.

• HAD A HOT ONE this morning," said Tom. "Fellow brought his car in with the complaint that it stopped every few miles. Started normally after about a half hour's rest, then ran a few miles more and did the same thing."

Tom was one of those independent service shop owners who Jim, the Instrument Man, considered his "boys." The two had met ("accidentally on purpose," as far as Jim was concerned) at a favorite lunch spot, and been joined by Frank. Another of the "boys," Frank ran a service shop a few blocks away, and was one of Tom's close friends.

After the waitress took their orders, Tom went on with his story: "I told this customer to leave the car 'till I looked it over. Promised to call and let him know what the trouble was and how much it would cost to correct.

"To be on the safe side, I hooked up the 'scope and found that the ignition was perfectly normal. We let the engine run about ten minutes, then it began to hesitate, missed a few times and died."

EXPERIENCE PAYS OFF

He turned to the Instrument Man. "At that point, Jim, I remembered a case you told me about awhile back —and I checked the gas tank cap. That was the answer alright!

"Some one had put a radiator cap on the gas tank, and shut off the vent so that practically no air could get in. Naturally, not much gas could get out before a 'back-vacuum' built up, so the carburetor was 'starved' for fuel and the engine stopped.

"All it took to cure this case was to put on the right gas tank cap—and make sure the vent was open. We charged the owner an hour's labor, plus the price of the cap. He was sure tickled to get off so cheap!"

Nodding approvingly, the Instrument Man complimented him. "You did alright on that one. It's easy to overlook that kind of a trouble source, and waste valuable time hunting."

TROUBLE FORECAST

Tom and Frank knew there'd be more advice coming, and they weren't disappointed. Jim went on:

"From now on you'll be getting the usual summer crop of puzzles. Vapor lock, for instance, is about 'in season.' Car owners who don't drive very much are likely to have conditions that will cause vapor to form in the fuel system and give them trouble."

Jim looked at the two of them keenly, smiling a little. "Do you boys really know what vapor lock is?"

After a brief pause for thought, Tom replied, "Well, it's kinda hard to put into words. How do *you* describe it?"

WHY INSTRUMENT CORNER?
Because we know the help he's given so many shops first-hand is just as valuable in the re-telling as it was in the happening, we've asked The Instrument Man to pass along some of his more interesting experiences. As an old-timer in automotive servicing who is distinguished by the fact that he's kept up-to-the-minute on developments in his field, The Instrument Man gets many calls for help from friends, acquaintances and even strangers, in shops large and small. He generally solves the cases, because of his understanding and appreciation of trouble-shooting instruments.

"You can define it as the condition that exists when the fuel pump is unable to keep the main metering jets in the carburetor covered with fuel," the Instrument Man told them. "The fuel pump originally installed on the engine has enough capacity in reserve to keep the carburetor float bowl filled to the correct fuel level at all times. It can handle any speed or load the car is likely to encounter."

"But," Jim continued, "the fuel pump can't do that when it's pumping air or fuel vapor, instead of liquid fuel. Either air or fuel vapor will prevent positive displacement. They stretch and compress like springs—it's the same action as you feel as 'spongy brake pedal' when the air gets into a hydraulic brake system.

"As far as vapor lock goes, notice I said 'either air or fuel vapor' can be the cause," Jim cautioned them. "Don't forget that point."

LOOK FOR INLET LINE LEAK

With Tom and Frank "drinking in his words," along with their coffee, the Instrument Man went into more detail:

"Air can enter the system from a leak in the inlet line. You know that the fuel pump does its job by lowering pressure in the line and creating 'suction' . . . permitting the atmospheric pressure vented into the tank to force—you might say, push—fuel through the line and to the pump."

"If there is the tiniest leak in the fuel line between the tank and the pump, atmospheric pressure can force air in as bubbles in the liquid gasoline. That's one frequent cause of vapor lock, or insufficient fuel delivery."

AIR NOT SOLE VILLAIN

Noting approvingly that his boys were following him with complete understanding, Jim "zeroed in" on some other angles of the problem.

"Heat is the most common cause of fuel vaporizing in the line. Gasoline is volatile, and it will boil and turn to gas when heated—but the boiling point depends on the pressure in the fuel-handling system. The fuel line is surrounded by heat from the exhaust system and the road.

"In extremely hot weather, and possibly on long hot drives, conditions can become severe. If the pump is not in first-rate condition — as to length of stroke, actuating spring, tight check valves, good diaphragm—the driver can find himself in 'real' trouble."

The Instrument Man explained: "As long as the pump has correct

(*Continued on page* 80)

The Solex Carburetor . . .

(Continued from page 53)

mixture is important and should only be adjusted after the engine has been brought to normal operating temp.

IDLE ADJUSTMENT

Warm the engine up to normal operating temperature. Turn the control (idle mixture) screw in until it seats lightly. Do not force it since this will damage the screw and seat. Back it off approximately ¾ turn. Turn idle speed adjusting screw (throttle stop screw) until an idling speed of approximately 550 r.p.m. is attained. Now make the final adjustment of the idle mixture to get the highest speed without touching the throttle. Then readjust the idle speed adjustment to get the correct idling speed (550 r.p.m.).

To check for free operation of the throttle linkage and throttle valve, open the throttle wide to speed up the engine, then let it snap shut. The engine should not stall. If it does, enrich the idle mixture a little by backing off the idle mixture screw.

CARBURETOR REMOVAL

Remove the air cleaner, disconnect the fuel line, accelerator cable and choke cable. Then unscrew the carburetor flange nuts. When installing always use a new flange gasket.

CLEANING CARBURETOR

To dismantle the carburetor for cleaning, remove air cleaner, disconnect fuel line, and remove carburetor bowl cover. If the bowl cover has to be removed completely, choke control cable must be disconnected.

Remove float assembly, pilot jet air bleed, pilot jet, air correction jet and emulsion tube. Jets and passages should be cleaned with compressed air. The venturi can be removed after the retaining screw has been taken out. If there have been complaints about flat spots on acceleration, the accelerating pump is not functioning and new parts should be installed.

INSPECTION

Check needle valve for correct seating. Check accelerating pump diaphragm. Check float for leaks by dipping in hot water and watching for air bubbles. If leak is observed, replace float. When reinstalling venturi make sure that it is installed correctly (Fig. 4). Do not overtighten the retaining screw. Check clearance of throttle shaft; air leaks at this point will upset the mixture. Inspect idling mixture control screw for correct seating.

SUMMARY

From the foregoing it will be seen that this carburetor should not offer any servicing difficulty to a mechanic who is used to working on American units. The nomenclature is somewhat different, but the functions of the parts will be understood if the corresponding functions of our domestic carburetors are understood.

Even though the foreign cars appear to differ considerably from American practice, with a few exceptions, good mechanical practice as applied to our own cars will apply to the foreign cars.

Solex Specifications for Volkswagen

	1131 cc Engine	*1192 cc Engine*
Venturi	20 mm	21.5 mm
Main Jet	105 mm	122.5 mm
Pilot Jet	50	50
Pilot Jet Air Bleed	.8 mm	.8 mm
Air Correction Jet	2.0	2.0
Pump Jet	50	50
Pump Air Correction Jet	2.0	2.0
Emulsion Tube	10	29
Needle Valve	1.5	1.5
Float Weight	12.9 gram	12.5 gram
Pump Feed, Per Stroke	.40-.55 cc	.40-.55 cc

TORQUE WRENCHES
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For over 130 makes and more than 1200 models of automobiles (U.S. and Foreign), trucks, tractors, outboards, motorcycles, diesel, aircraft, marine and small air-cooled engines. SPARK PLUG — WHEEL BEARING — OIL FILTER — VALVE SPRING DATA and many helpful torque tips — adapter rule . . . plus handy torque chart for all screws — No. 4 to and including large 2 inch bolts. 31 pages of factory approved information.
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They are your assurance of high quality, long life and guaranteed permanent accuracy.
Quality Tool Suppliers Handle These Flexi
Beam Torque Wrenches

New Tune-Up Charts Cover Specs of All 1959 Cars

Automotive Electric Association has announced the release of Interim Tune-Up Charts with early production specifications for all 1959-model passenger cars.

Now available at $3.00 a set, with a booklet covering 1959 Wiring Dia-

grams, the charts will be replaced without additional charge by Permanent Charts, which will include any later production spec changes.

Each chart provides the key electrical and fuel specs, as well as parts numbers. According to J. Howard Reed, AEA Executive Secretary, the Tune-Up System has been developed by the Association in conjunction with original equipment manufacturers. Those interested in obtaining the Tune-Up charts should write the Automotive Electric Association, 16223 Meyers Road, Detroit 35, Mich.

Adjusting Plymouth's Power Brake Free Play

The Plymouth power brake booster has two main adjustments—trigger arm and pedal free play—which the factory states are important and must be made carefully to insure proper power brake performance and to prevent the possibility of brake shoe drag.

Pedal free play determines how far the pedal will travel before the master cylinder piston applies pressure to the brake fluid.

The trigger adjustment, which must be made after pedal free play is adjusted, determines how soon the power assist goes into action.

Free Play Adjustment: A free play adjustment check should be made at *no vacuum* (engine not running). Apply the brakes several times to relieve all vacuum. Insert a wedging tool (screwdriver will do) between the trigger pivot and the rear side of the hole in the power brake lever, forcing the brake pedal and power lever apart.

Check free play with linkage in this position by pushing lightly at pad end of the brake pedal. This will give a true free play measurement between master cylinder piston and push rod. Pedal free play should be from 1/16" to ⅛". Lengthening or shortening of the master cylinder push rod, if necessary, should be done at this time. Be sure to tighten lock nut after adjusting master cylinder push rod. If the trigger pivot and power brake lever are not wedged apart, a false free play setting will be measured at the pad end of the pedal.

Trigger Adjustment (on car): After pedal free play is adjusted properly, a final check should be made to assure maximum performance of the booster.

a. Slight rotation of the adjusting cam in a clockwise direction will speed up a slow pedal return.
b. A slight adjustment of the cam in the counter-clockwise direction will eliminate a time delay during a fast application.

Note: When performing trigger adjustment as described above, it is important that the cam arrow points upward to at least 90 deg. of the pedal centerline.

c. Booster chatter can often be corrected by bleeding the brakes. If the chatter persists, rotate the adjusting cam clockwise until the chatter is no longer evident.

Rod inserts are designed to carry the high bearing loads of today's high-powered engines. They are precision-manufactured but they are also flexible and shape themselves to the rod bore.

IF THE ROD IS STRETCHED AND OUT-OF-ROUND, THE ASSEMBLED INSERTS WILL BE OUT-OF-ROUND: THEY CANNOT DO THE JOB THEY'RE DESIGNED TO DO.

If you don't recondition a stretched rod why waste money on new precision inserts? It's "false security" because you're taking a chance on the complete job.

This rod problem has become more critical in today's engines because rods are lighter, inserts narrower, RPM's higher, heat is greater, and bearing loads much heavier.

The *only* safe way is to check all rods and have them reconditioned to original size. Why not give your customers this first-class shop service by having their own rods reconditioned? Sunnen reconditioned rods are guaranteed to serve as well as brand new rods.

Contact your jobber who gives this up-to-date Sunnen Rod Reconditioning Service and see for yourself.

962

SUNNEN

These are new *manufacturers' products*

HOW TO GET RUSH INFORMATION

If you want further information or literature describing the products shown in our "These Are New" pages, just use the handy Business Reply Card you'll find further back in this issue. Whether you want information on one or more of the products, all that is necessary is to mail this Postage paid card properly filled out to AUTOMOTIVE SERVICE DIGEST. Our Reader's Service Dept. will contact the manufacturers directly and see that you obtain the requested information as quickly as possible.

Barrett Super Drum Lathe

Barrett Equipment Co. announces the B-900 Big "B" Super Drum Lathe, especially developed for heavy-duty truck, bus and fleet operators, as well as jobber and specialty shops who service all size drums.

Completely new rugged design

combines power, speed and accuracy with separate carriages for machining and grinding at the same time on drums from 7" to 40" diameter and 16" face. Includes rapid traverse carriage with 16" travel for handling today's deep drums with ample reserve for wider drums of the future.

Selective feeds range from .0025" for a superior finish to .025" for roughing cuts. The main spindle with a diameter of over 3" supports with ease all ordinary dual wheel assemblies and the unique new steady rest insures extreme accuracy.

(Circle No. 1 on Reader Service Card)

Maremont Litterbags

Newest giveaway item being offered by Maremont Muffler Div., is a polyethylene litterbag suitable for holding maps, trip records or disposable litter accumulated during long road trips. Personalized with the service shop imprint, the bag serves as a constant reminder to motorists that your shop is the local muffler installation headquarters.

The litterbag attaches easily on door and window handles or radio dial knobs because of a punched hole at the top.

(Circle No. 2 on Reader Service Card)

Indian Head Brake Fluids

Permatex Company, Inc., announces the addition of a heavy-duty and a super heavy-duty brake fluid to its Indian Head line.

The new Super Heavy-Duty Brake Fluid exceeds SAE specifications 70R1 and 70R3 to cope with the higher temperatures developed when stopping today's heavier, faster cars. According to the manufacturer, it remains effec-

tive throughout a wide temperature range, is chemically stable to prevent gumming, and has no harmful effects on vital rubber or metal components in the system. In addition, it is said to provide lubricating qualities which reduce wear on all moving parts in the system.

The Heavy-Duty Brake Fluid, which exceeds SAE specification 70R1, provides dependable braking insurance under severe operating conditions. Like the super heavy-duty fluid, this non-corrosive, chemically stable formulation is compatible with all other brake fluids approved by car and truck manufacturers, and is harmless to rubber and metal.

(Circle No. 3 on Reader Service Card)

Tire Repair Kit

By combining all required tools and materials in a handy, sturdy package, the Schrader No. 5072 Kit is said to eliminate time lost in searching for special tools, patches or fluids when repairing auto and truck tires—both tube and tubeless.

In addition to 80—1½" x 1⅞" high quality "Fix Flats" patches and 12—2¼" round Nailhole patches, the kit contains 6—3¼" Rd., 4—5" Rd. and 2—6" Rd. nylon-reinforced patches for repairing cuts and punctures up to

½". A roll of special self-vulcanizing stock is included for use with self-vulcanizing fluid as a permanent filler. All patches feature multiple layers of tough flexible rubber, laminated for extra strength, plus a layer of quick curing gum and an easily removed Holland Cloth protective covering. Larger sizes have four-ply Nylon reinforcement and are distinctly marked for proper placement with relation to tire bead.

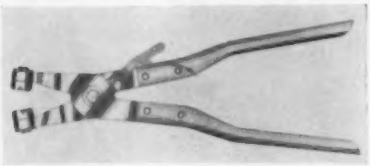
The All-Service Kit contains a 12-oz. supply of Schrader pre-buffing cleaning solution to facilitate removal of dirt, mold lubricant and soapstone accumulations; two 4-oz. tubes of "Fix Flats" self-vulcanizing fluid; as well as a tempered wire buffing brush, a specially designed insertion tool, a skiving knife with convenient curved blade, and a stitcher with a knurled-edge wheel to assure positive contact of the patch to the prepared area.

(Circle No. 4 on Reader Service Card)

Hose Clamp Plier

A hose clamp plier with finger-tip position lock is announced by Herbrand Tools, the Bingham-Herbrand Corp.

According to the manufacturer, the



new "finger-tip" feature makes it possible to lock the plier in any one of three positions, freeing the mechanic's hands for other work. Lightweight and perfectly balanced, the tool is said to make easy work of replacing the lower radiator hose.

(Circle No. 5 on Reader Service Card)

Marine and Small Engine Plugs

Electric Auto-Lite announces the A2X cold heat range marine and small engine spark plug, designed especially to combat plug fouling associated with the operation of cold spark plugs in modern outboard engine applications.

The shell of these new plugs is of a special gold-finish, developed by Auto-Lite to resist corrosive effects of rust, heat and oil; a special clipped-off side electrode resists erosion caused by magneto ignition and prevents gap bridging. Seat gaskets are permanently attached for convenience in installing the new plugs.

(Circle No. 6 on Reader Service Card)

Low Cost Balancer

It is now possible for repair shops to enter the wheel balancing business for an investment of less than $100, thanks to John Bean's "package" offer

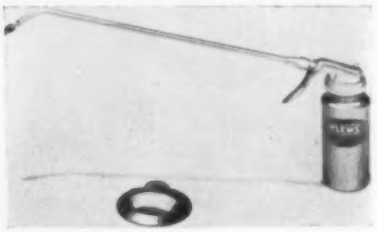
of a Model 1040 Acra-Speed Wheel Balancer and a supply of weights—enough to balance 150 wheels.

Balancing with the Acra-Speed is accomplished simply and dependably by removing the wheel from the car and setting it on the balancer. An indicator on the top of the machine registers the out-of-balance condition and shows the exact position where the weights should be placed. A minimum of moving parts simplifies its use.

(Circle No. 7 on Reader Service Card)

Pistol Oiler

A new six-ounce pistol oiler with a twelve-inch spout, which enables a mechanic to lubricate the generator and other hard-to-reach parts without



burning his hands, is announced by Plews Oiler, Inc.

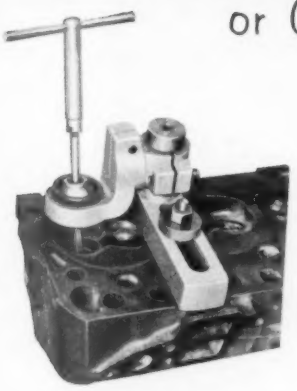
One piece, seamless construction is used on the new unit, which comes complete with a flared detachable base.

(Circle No. 8 on Reader Service Card)

Install Valve Guides

or Oversize Stem Valves with K.O. Lee

Valve Guide Reaming Tools



The K. O. Lee valve guide reaming tools are designed to service late model engines which have valve guides cast as part of the cylinder head. These tools can be used to install oversize stem valves or replaceable valve guides.

The K. O. Lee reamer guide provides a true alignment with original guide bore using Lee self-expanding pilots. The reamer is held rigid with reaming bushing during reaming operation. Simple to operate and extremely accurate. Power drive is available.

Oversize reamers are used to ream out the valve guides for oversize stem valves. Most of the engine and valve manufacturers now offer at least three sizes of oversize stem valves.

When old valves are still serviceable, it is more economical to install replaceable valve guides. Roughing and finishing reamers used with the K. O. Lee reamer guide, accurately cut the recess for a replaceable guide.

Write for descriptive literature which includes a listing of replaceable guides and special sets available.

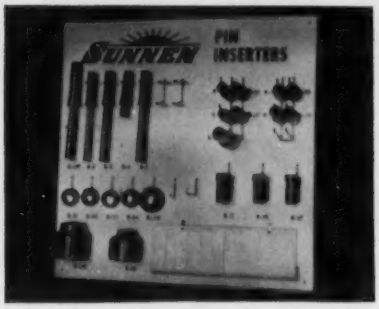
K. O. Lee Company, Aberdeen, South Dakota

These are new *manufacturers' products*

Pin Inserter Set

Sunnen Products Co. announces a new Pin-Inserter Set (B-500) for handling all press-fit rods, including those used in the '59 automotive engines.

Featuring a wall hanging type se-

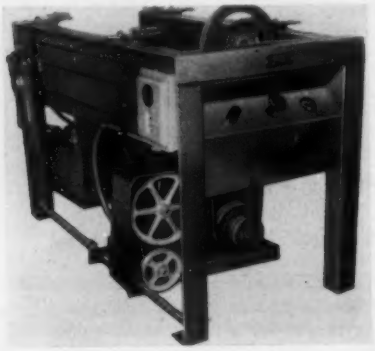


lector-storage board on which tooling units are identified by part nos. and a removable "set-up" chart, it is said to greatly simplify work on press-fit type wrist-pins. Ample room is provided on the storage board for tooling additions that may be required for future engines. Manufacturer states that wrist-pins can be removed in one operation and rods and pistons reassembled in one operation, with tooling supplied in the B-500 set. Pins are automatically centered in piston bosses during reassembly.

(Circle No. 9 on Reader Service Card)

Engine Test Stand

To eliminate costly comebacks and complaints on rebuilt engines, and to assure customer satisfaction, the B-C Test Stand Co. is offering an engine



test stand that provides a cold-run method of testing, inspecting and running-in rebuilt engines — either partially assembled (short block without head or pan) or completely assembled engines.

After being mounted on the stand, the engine is driven or motorized by a low r.p.m. electric motor. Two speeds of 450 and 700 r.p.m. are provided by means of two special dual drive sheaves mounted on the electric motor shaft. Filtered oil is pressure fed to the engine, when running a short block assembly by a special oil pump.

Quick mounting of the engine on the stand is accomplished by means of four adjustable mounting bars, the installation taking from 5 to 10 minutes.

(Circle No. 10 on Reader Service Card)

Lift Attachment for Small Cars

To permit servicing small, narrow-track cars on existing "drive-on-type" lifts, DeGreen Sales and Service Co. announces a new Lift Attachment that

can be easily clipped on to the lift's main rail.

Installation is said to take under two minutes, requiring no nuts, bolts or other inconvenient fasteners. The ramp is ¼" checkered plate and the trough is 12' long by 7" wide. Units are made for the left or right hand rail of any drive-on-type lift.

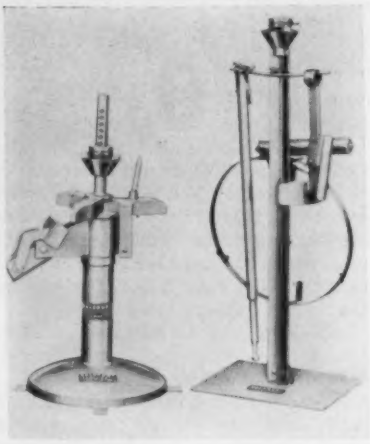
According to the manufacturer, the unit can usually be left right on the lift, since it does not interfere when other cars are serviced.

(Circle No. 11 on Reader Service Card)

Heavy Duty Tire Changer

Fast, effortless mounting and dismounting of all size tube and tubeless automobile tires, including special 12 ply tires and over, are said to be provided by the latest Salsbury Heavy Duty "Model D" Tiremaster.

New double-action hold down cone with concealed threads is said to virtually "bolt" wheels to the unit's pedestal with split-second action. One combination mount and dismount tool supplies the leverage necessary for



loosening beads, and five precision rollers quickly roll beads over rim flange. Open, three-arm wheel support construction allows quick access to valve stem on wheels which must be handled valve side down.

(Circle No. 12 on Reader Service Card)

MoPar Push-Button Spray Paint

New easy-to-use spray cans of touch-up paint and assortments of lacquer, primer and leveler are now available from MoPar Division of Chrysler Motors Corp.

Recommended for dealer and gen-

eral repair shops, the fast drying lacquer is available in a variety of colors to spot-finish bodies on any 1958 or 1959 Chrysler-made product.

Pressurized 6 oz. cans contain chemicals which expand and become gaseous when the valve is pressed to atomize the paint and carry it to the surface being sprayed.

(Circle No. 13 on Reader Service Card)

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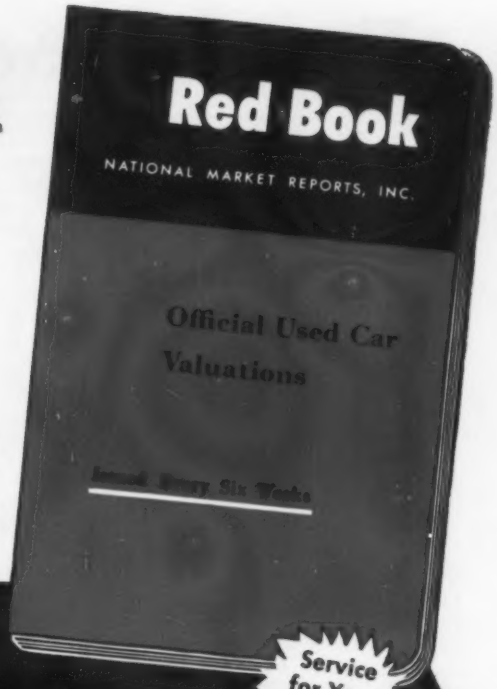

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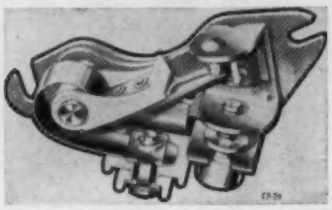
OR OTHER LINE OF BUSINESS_____ RB-F

These are new *manufacturers' products*

"Unitized" Nylon Arm Contacts

F. & B. Mfg. Co. announces a complete replacement line of "Unitized" nylon arm contact sets—in both Filko "pre-set" factory pre-assembled and conventional types—for practically every make and model vehicle.



Said to be the first complete line with "Unitized" nylon construction, Filko design combines the bearing, rubbing block and breaker arm into one streamlined unit. In addition, the company states that its newly developed nylon treating process gives the entire unit extra service for longer lasting high-speed performance.

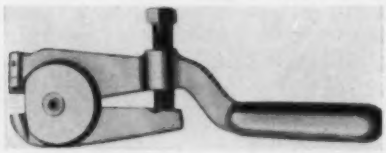
The result is said to be lighter weight construction, practically indestructible friction-free bearing, perfect arm balance and perfect precision-set point alignment for the entire life of the unit.

(Circle No. 14 on Reader Service Card)

Nut Splitter

A versatile 12-in. hand tool for fast, safe splitting of nuts and removing them from threaded bolts has been developed for use in automotive repair shop, by Doan Tool and Die Co.

The new tool combines lever power with screw pressure to grasp and



split all types of nuts on all bolt sizes ¼-inch through ½-inch. This includes most nut-bolt combinations on automobile shock absorbers, mufflers, battery terminals, bumpers, hose clamps, motor mounts and other body parts.

Of forged, heat-treated steel, the tool has a swivel cutting jaw freely adjustable to cut from any angle. It is easily removable for routine resharpening. The tool does not have to completely surround the nut to split and spread it, as is necessary with other tools of this type.

In use, the tool cutting edge is placed on any part of the nut face and tightened. Torque is applied by wrench to a screw that exerts a 2-to-1 leverage action at the jaw, easily fracturing the nut for fast removal without bolt thread damage.

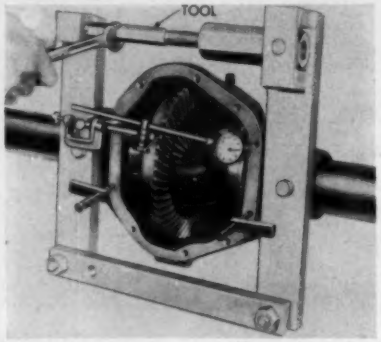
Since nuts are removed cold without thread damage, the tool eliminates the need for replacing such parts as rubber tail pipe hangers, muffler clamps, spring shackles and U-bolts and bumper bolts.

(Circle No. 15 on Reader Service Card)

Axle Housing Spreader

In order to remove the differential assembly from 1959 Dodge four wheel drive trucks, the axle housing must be spread to relieve the built-in preload or "pinch' on the differential side bearings.

To facilitate this service procedure, Miller Mfg. Co. are now supplying a rugged spreader that safely spreads



the axle housing to allow the ring gear assembly to be easily removed and reinstalled with a minimum of effort. Attempting to "beat" the ring gear assembly out of, or back into the axle, not only takes a great deal of extra effort and time, but can readily cause serious and expensive damage to vital axle gears and bearings.

The dial indicator assembly, also shown, is sold as an accessory tool, for it is essential to measure the exact spread of the housing in thousandths of an inch. If the axle is not spread enough the ring gear assembly will not come out readily. If the housing is spread too much, desired bearing preload can be permanently disturbed, causing premature bearing wear and axle noise.

(Circle No. 16 on Reader Service Card)

Platinum Electrode Spark Plugs

Two new spark plugs with platinum electrodes — designed for outboard motors and special automotive uses —are being offered by AC Spark Plug Division of General Motors.

Designated as 440P and M425P, the plugs are said to give trouble-free operation, even when used on outboard motors subjected to plug fouling, slow speeds encountered during a day of fishing.

The plugs have extra long insulator tips to get rid of heat swiftly, a platinum center electrode embedded in silver, and a fine-wire platinum side electrode. A "spin-on" gasket, already on the plug, makes installation easy, and a universal terminal at the top of the plug will accept both common types of wiring clips.

(Circle No. 17 on Reader Service Card)

Push Button Jacks

A new push button electro-hydraulic, 1½-ton capacity, one-end lift is announced by the Blackhawk Mfg. Co.

The new unit operates on a standard 6-volt battery for a week of normal use without recharging . . . the battery storage being completely self-contained with no cords or complicated maze of wires.

Lifting arms extend from 14" to 58" to accommodate the many different styled bumpers, tail pipes and extreme

widths of many late model cars. Safety wide 5" x 5" saddles are fixed so shopman does not have to bend underneath car to adjust them for proper contact. According to the manufacturer, weight loads do not have to be exactly centered; the saddles scientifically spread the weight. Contact can be made at any point on the saddles without fear of the car's slipping or of the saddles turning during the lifting operation.

Easy mobility is supplied by swivel nose wheel and large steel rear wheels. An automatic mechanical safety device locks lift in any raised position from 8" to 30".

(Circle No. 18 on Reader Service Card)

Cartridge-Type Fuel Filter

A new cartridge-type fuel filter with positive super-micronic filtration that is said to prevent stalling, hard starting, rough idling and fuel waste has been announced by Purolator Products, Inc.

Based on the same principle as the micronic oil and air filters, the Purolator GF-11 Fuel Filter is claimed to afford a finer degree of filtration than

current ceramic type fuel filters. The pleated construction of this resin-impregnated cellulose filtering element makes it possible to provide nearly 50 sq.in. of filtering surface within the compact, sturdy metal case and still have ample dirt retention space. According to the manufacturer, this feature makes it unnecessary to include a relief valve which could permit accumulated dirt to flow directly into the carburetor.

The unit can be installed either horizontally or vertically at any point where there is six inches or more of straight tubing. Hose connections fit 5/16" O.D. tubing perfectly, but can be stretched over 3/8" O.D. tubing if necessary.

(Circle No. 19 on Reader Service Card)

Fuel Line Fittings and Parts

A new fuel line fitting assortment and parts kit, called the RediFit Kit, is announced by Milesmaster, Inc. to enable service shops to make immediate installation of new fuel lines, fuel pressure regulators, filters, etc. for practically every car and truck.

The kit consists of 38 fuel line fittings, each identified by letter so selection for particular cars can quickly be made. The kit also contains five replacement parts for Milesmaster units, all being packaged in a clear styrene plastic case with individual compartments for each of the parts. Also furnished with the kit are Index Sheets that show at a glance the fittings needed for any particular make or model of car.

(Circle No. 20 on Reader Service Card)

Wiper Blades and Arms

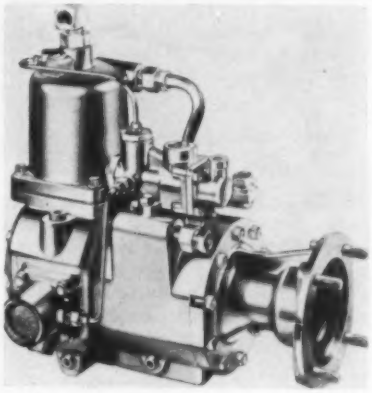
Latest addition to the Anco (Anderson Co.) Red Dot Turtleback line is a 15" windshield wiper blade which is said to feature a stronger superstructure and a replaceable rubber element. When operating under 15 oz. of arm pressure, this blade reportedly delivers the cleanest possible full-pattern wipe without danger of stalling or scratching the glass.

A replacement wiper arm for use with wiper blades 15" and longer is also available for use on all Chrysler Corp. cars since 1957, and all 1959 GM and Mercury cars.

(Circle No. 21 on Reader Service Card)

Rotary Drive-Thru Compressor

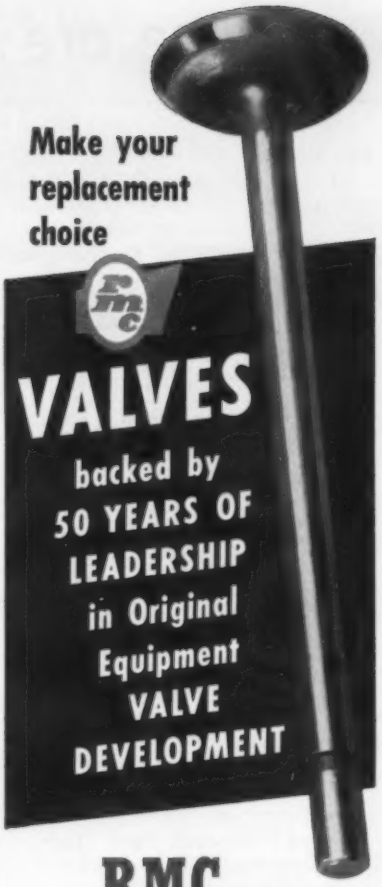
The Automotive Division of Wagner Electric Corp. announces a 12 c.f.m. rotary compression drive-thru compressor for use with automotive Diesel engines to produce a dependable



air reserve and give rapid air pressure recovery.

Design of the compressor eliminates the use of thrust absorbing components and rotary seals operate with a minimum of load for extended life. Improved channeling of the lubricating system provides better oil circulation to all moving parts, and a lubrication system circulates engine oil through the compressor during the non-pumping cycle to cool the compressor between cycles by completely changing the oil in the sump.

(Circle No. 22 on Reader Service Card)



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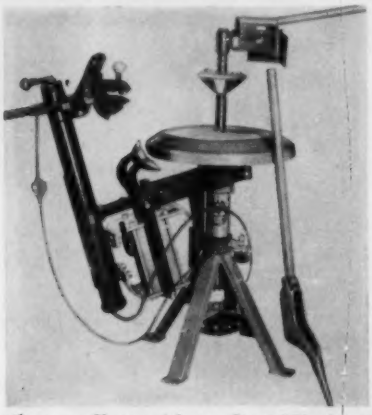
These are new *manufacturers' products*

Powair Tire Changer

Big Four's P-58 Powair Tire Changer has been improved by the addition of a new nylon air tube, which is said to be impervious to grease and



oil, as well as withstanding 2½ times more pressure than rubber; a safety-flate automatic inflator that shuts off at a pre-set pressure, permitting observation of bead seating at a safe distance; and a Dri-Clean air filter to keep dirt and moisture out of air lines for trouble-free operation.

Basically the unit remains unchanged — its finger-tip control (1) locks tire and rim in working position, (2) breaks both beads at the same time, and (3) releases tire and rim for balancing.

(Circle No. 23 on Reader Service Card)

Stroboscopic-Tachometer

A new device for accurately determining the r.p.m. of any rotating or reciprocating mechanism without any mechanical contact with the revolving object is announced by Kent-Moore Organization, Inc.

Called the J-6789 Uni-Tac, this probe-type stroboscopic tachometer is completely portable and self-contained, requiring no outside power source. It utilizes a controllable intermittent flash of light on the rotating object and automatically registers r.p.m. on its speed range scale.

(Circle No. 24 on Reader Service Card)

Windshield Washer Solvent

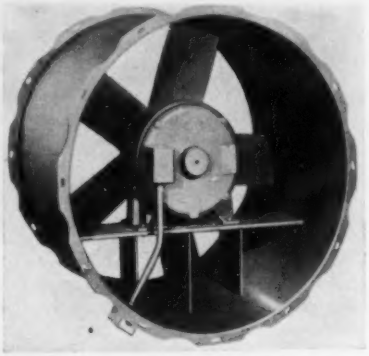
A new windshield washer solvent for normal all-season driving conditions and ideally suited for **all** types of washers, has been announced by the Delco Appliance Division of General Motors.

Sold under the trade name of Delco Special 19, this unique non-foaming windshield washer solvent, when added to water in washer jar as recommended, is discharged through washer nozzles in fine jet-like streams; and the solution is harmless to car finishes.

(Circle No. 25 on Reader Service Card)

Duct-Type Ventilation Fan

A newly designed tubeaxial duct fan, as easily installed as a section of duct and using no more space, has been announced by Ilg Electric Ventilating Co. Sixteen sizes, ranging in capacity from 1,040 to 21,200 c.f.m. at



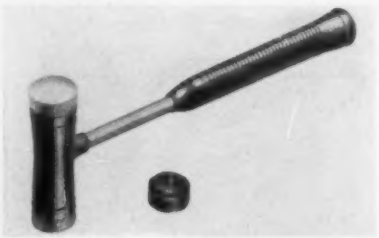
static pressures up to 1½ inches, are available.

The new Ilg unit can be mounted in any position. Smaller sizes features a 3-blade propeller; and the larger, a new 5-blade design. The fan wheels are directly connected to a totally enclosed motor with permanently lubricated ball bearings, assuring maximum service life with a minimum of attention. The fan unit is mounted in a rugged, welded steel housing with flanged ends forming a completely prefabricated fan and duct section.

(Circle No. 26 on Reader Service Card)

Soft-Face Hammer

A tough, light-weight, soft-face mechanic's hammer with no exposed metal parts is announced by Proto Tool Co. Replaceable tips in medium or tough hardness can be easily and



quickly changed for any given job or surface, and, according to the manufacturer, the tips won't mushroom or flake off, are resistant to grease, oil, gasoline and common acids. Shot-loaded head is said to add 30% more power to the driving force with minimum rebound, reducing user fatigue.

(Circle No. 27 on Reader Service Card)

Here's a Small Part That Creates BIG Business!

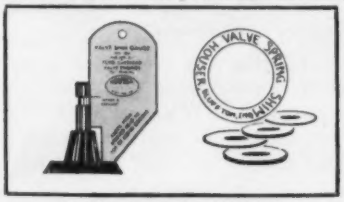
More and more shop men are reporting increased complaints of rough idling, poor fuel economy, and loss of power, according to C. N. Butts, Sales Mgr. Houser Engineering & Mfg., Inc.

Many of these troubles can be cured by a low-cost installation of one small part — HOUSER Valve Spring Shims.

C. N. Butts

Restores New-Car Power, Economy

This small (but vital) part restores valve spring tension that may have been lost through valve grinding or wear. This not only causes loss of power and fuel economy, but also shortens valve life. For only pennies HOUSER Shims bring tension back to factory tolerances, thus eliminating valve flutter and surge and provide full, new-car power and economy.



A Simple, Two-Step Job

Any mechanic can easily install HOUSER Shims with complete accuracy.

(1) Measure correct valve spring operating height with patented HOUSER Shim Gauge.

(2) Install required number of HOUSER Shims (.035" and .020" thicknesses) under spring.

A few minutes work . . . a few cents in cost . . . and you enjoy complete customer satisfaction.

For information and free sample write to: **Houser Eng. & Mfg., Inc., Bluffton, Ind.**

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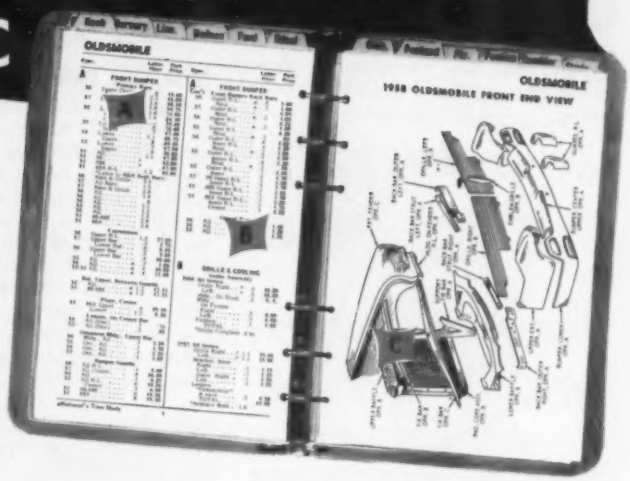
*Where no factory flat rate exists, labor hours are based on National's Time Study.



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(MMA)

These are new *manufacturers' products*

Valve Spring Shims and Gauges

Houser Engineering & Mfg., Inc., announces an eye-catching pegboard and metal non-tip counter display which tells how their valve spring shims and gauges restore "like-new" power, speed and economy. A "take-one" literature rack at the top of the display holds a large supply of informative booklets.

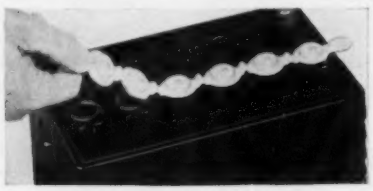
Three large metal shelves stock a conservative supply of the most popular sizes of Houser Shims. Five metal hooks at the top of the display hold an assortment of Shim Gauges, packed in plastic see-through bags for easy identification.

(Circle No. 28 on Reader Service Card)

Zip-Strap Battery Vent Cap

The "Zip-Strap" battery vent cap or cover, recently announced by Western Coil & Electrical Co., is a 1-piece unit designed to cover all six cells in a 12-volt battery.

Molded of unbreakable, acid-proof, polyethylene, the caps are available in two styles—a plug-in type, or a snap-on type—and the manufacturer states they cannot vibrate loose.



With all six caps connected together, battery cell inspection is said to be simple and fast—no unscrewing one cap at a time . . . also eliminates cap loss or breakage.

The caps are self-draining, have domed vent outlets, and the manufacturer states that the snap action gives protection from excessive pressure in battery cells caused by clogged vents, etc.—the Zip-Strap will blow off before battery can explode or rupture case.

(Circle No. 29 on Reader Service Card)

New Car Paint Protector

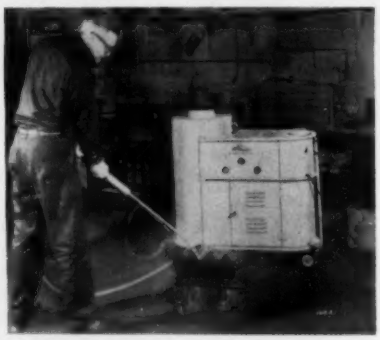
A protective coating for the acrylic lacquers and "super" enamels used on virtually all 1959 cars has been developed by DuPont. Known as "Car Shield," the product is formulated especially for use during the first year to 18 months of car-life to enhance the high luster as well as to provide a water repellent surface that washes easier. It is simply spread on and, when dried to a haze, whisked off with a dry cloth. It does not contain abrasives, and is therefore not intended for use as a cleaner. When the new auto paints begin to dull, a cleaner should be used prior to application of the new material. When chalking sets in after a long period, standard wax or polish should be used after cleaning.

(Circle No. 30 on Reader Service Card)

Steam-Jet Cleaner

Faster steam cleaning for repair and overhaul shops is said to be possible with a new, 100 gph., portable, oil-fired steam-jet cleaner recently introduced by Pantex Mfg. Corp.

Mounted on four large, rubber-tired wheels, the cleaner is a completely enclosed, compact machine with built-in soap tank and controls. It can be operated on kerosene or #1 or #2 fuel oil. Ignition is fully automatic and fuel pressure is modulated to develop the gun-nozzle pressure desired, as shown on an easily visible gauge. Heating coils are ½" in diameter, continuous wound for maximum efficiency and tested for 1,000 psi.



Also, as standard equipment, the unit incorporates a water float tank with an anti-siphon valve. This assures uniform water flow and, at the same time, avoids danger of supply contamination, as required by law in many states.

Soap tank has a 5 lb. dry capacity; no pre-mixing is necessary and normal operation, with one filling, is 6 to 7 hours. The unit is equipped with a ½ hp. heavy-duty motor, 20 ft. of wire-braided ½" steam hose and racks for hose and power cord.

(Circle No. 31 on Reader Service Card)

Jack Adapter Aids Pan Removal

To save time in oil pan removals on modern, low-slung cars, Walker Mfg. Co. has a new jack adapter, known as the Rota-Way, which, when installed on any 3 or 5 ton portable hydraulic jack permits free rotation of the crankshaft while the engine is raised.

In raising the engine, Rota-Way's rollers contact the harmonic balance pulley attached to the front end of the crankshaft. With the pulley resting on rollers, counterweights and crank throws can be rotated away from the oil pan while the engine is supported.

According to the manufacturer, the adapter eliminates the need for accurate crankshaft rotation before raising the engine and the time-consuming lowering and raising of the engine to correct the rotation.

(Circle No. 32 on Reader Service Card)

Handy Aerosol Degreaser

Available from Rust Master Chemical Corp. in a handy, 16-oz., aerosol spray can, is the company's new, ready-mixed Degreas-Master, which is said to make degreasing jobs easier and faster than ever.

Self-emulsifying and self-scouring, the new cleaner is said to clean with just a spray . . . a rinse . . . and all grease, oil and dirt disappear into a milky solution that floats away down the drain without clogging. The manufacturer further states that Degreas-Master is completely safe . . . non-caustic, non-toxic, non-flammable, and usable on all metals.

(Circle No. 33 on Reader Service Card)

"Blue Streak" Eye Catcher

An electric sign with flashing lights is being offered to dealers and distributors of "Blue Streak" heavy duty ignition parts by Standard Motor Products, Inc.

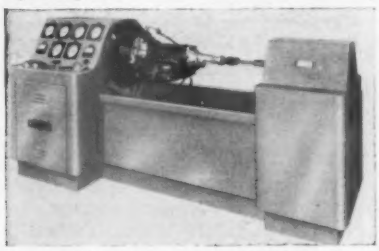
The 9" x 20" sign bears a three-

dimensional replica of the Blue Streak trademark in blue, red and yellow. It is made of heavy gauge transluscent plastic and can be installed in seconds on the inside of a door or window. Two incandescent bulbs provide a bright illumination whose blinking action is powered by a compact flasher.

(Circle No. 34 on Reader Service Card)

Transmission Tester

The new Model 8075 "Auto Hydradyne" just introduced by Lempco Products is an automatic transmission tester which exactly simulates all speed and load conditions. The "Auto Hydradyne" tests transmissions fast,



from eight to twenty minutes; oil is pre-heated and maintained at 180°, while r.p.m. and torque output is indicated 300 to 4,000 r.p.m.

The "Auto-Hydradyne" tests pump pressures and noise, shift points up and down, slippage, internal and external leaks. It allows easy adjustment of bands and valve body repairs, working from either side.

(Circle No. 35 on Reader Service Card)

New Paint Spray Nozzle

A new air cap for automotive spray painting, designed to give a "Super-Soft-Spray" (described as having a wider, wetter pattern) for use with the new acrylic and enamel automotive finishes, has been announced by The DeVilbiss Co.

Design of the nozzle involves the special location of two secondary jets so that they will intercept the side jets to reduce the impact and resultant forward velocity of the spray pattern. Consequently, a broader, softer and wetter spray with more thorough flow-out for a smoother, glossier coat is said to be attained. Better adhesion of the new finishes is also assured by this improved spray pattern, the company states.

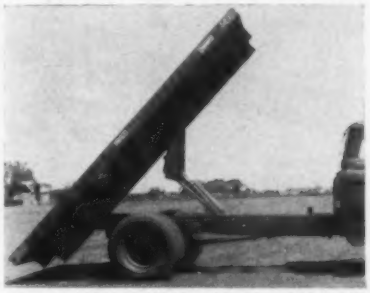
The distinctive tapered face of the cap has been developed to give smoother air-flow into the spray pattern and reduce the turbulence found over the blunt face of conventional nozzles.

Other features include a sturdier ring to withstand bumps and new resilient O-ring for three-way sealing against air leakage.

(Circle No. 36 on Reader Service Card)

Farm Truck Hoist

Schwartz Mfg. Co. is offering the "Uni-Link" farm truck hoist with or without a subframe and long beams and incorporating the Godberson



Powr-Link and "ahead-of-center" lifting action that is said to give smooth, fast and efficient performance. The company's conversion model (without sub-frame and long beams) increases customer pay load and yet gives sturdy, dependable and maintenance free service.

(Circle No. 37 on Reader Service Card)

Air Conditioner Service Tools

Complete air conditioning service can now be efficiently and profitably sold by shops staffed with trained servicemen using the simple, easy-to-

use tools shown here, and available from the Miller Manufacturing Co. The set includes everything from a powerful 110-volt vacuum pump for purging a system to special refrigeration type wrenches.

(Circle No. 38 on Reader Service Card)

I'm improving my profit picture on brake shoes bonded with

FRICTION CONTROLLED
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skillfully bonded by an experienced independent bonder in your area!

Friction controlled for longer service, NATIONAL'S dense, brass chip-impregnated composition assures quick acting safe braking – even under conditions of extreme heat. In any weather you can rely on NATIONAL for soft, sure stops.

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BRAKE BLOCK COMPANY
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37-17 57th Street, Woodside 77, N. Y.

These are new *manufacturers' products*

Impacutter Has 33% Fewer Parts

Ingersoll-Rand's new model Impacutter (Mc121) delivers approximately 3,000 blows per minute to efficiently cut sheet metal, bolts, rivets and spot welds; drive out rivets, bolts and pins; scrape undercoating, paint and dirt; split muffler tailpipe assemblies.

The new tool contains 33% fewer parts than previous metal cutters, resulting in lower maintenance costs and long, trouble-free life.

Newly designed throttle valve provides sensitive power control. Full range of speed and power is easily controlled by the "feel" of the trigger; there is no need for a separate power regulator. Self-contained throttle valve mechanism can be quickly and easily removed from handle for replacement without disturbing any other part of the tool.

Whichever you choose — complete units of EIS Master and Wheel Cylinders or the popular EIS Cylinder Repair Kits, you'll find that you can produce a better replacement job — a better rebuilding job — everytime!
The BRAKE JOBS start with EIS
Since 1956, nearly 70% of the wheel cylinders on America's finest and most popular cars (including Cadillac and Imperial) have been initially equipped with expander-type cups! For a perfect replacement, the obvious answer is EIS "E" Series HRC* Wheel Cylinder Cups WITH EXPANDERS! Use them on ALL brake jobs for a better seal!
*Heat-Resisting Compound
The BRAKE JOBS start with EIS
New! HYDRAULIC POWER BRAKE PARTS AND KITS for major and minor rebuilding on passenger cars and trucks! EIS catalogs as many as 126 different kits to provide extensive coverage, increased service and profits. All EIS Kits are factory-inspected to insure top-quality. Simplified and easy-to-understand-instructions are included in every package.
The BRAKE JOBS start with EIS
The Safety-Engineered Brake Parts Line that's now MORE COMPLETE than ever!
These EIS Brake Parts are typical examples of the advanced engineering, research and manufacturing the automotive replacement market has gained from more than a quarter of a century of EIS experience! That's why Brake Parts Jobbers and Brake Servicemen prefer EIS — INSIST on EIS for the brake parts that assure customer-safety and peak performance. It all adds up to increased service business, no come-backs, better net profit!
New!
CLUTCH SLAVE CYLINDER REPAIR KIT that incorporates piston with positive, built-in-stop feature! Prevents cup damage due to build-up of back-pressure through the clutch arm. These kits are available in two sizes—1" and 29/32" for various models of Ford trucks, 1957-'59.
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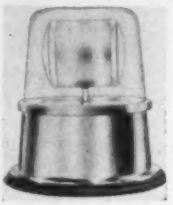
POWER BRAKE PARTS AND KITS
MASTER AND WHEEL CYLINDERS
BRAKE TOOLS • BRAKE HOSE
BRAKE CABLES • BRAKE EQUIPMENT
SUPER SAE BRAKE FLUIDS
Write for Descriptive Catalogs EIS AUTOMOTIVE CORP. Middletown, Conn.

A rugged beehive-type chisel retainer holds accessories securely, eliminating the danger of carelessly discharging the chisel from tool. The unit weighs 3⅝ lb., and is 7⅜" long.

(Circle No. 39 on Reader Service Card)

360° Revolving Light

Now in production by Trippe Mfg. Co. is a new type of 360° Revolving Seal-Beam light. Standing 11½" high, 10" in diameter, the Roto-Flash is a rugged heavy duty revolving light flashing 90 times a minute. Built to high standards of quality and yet priced far below the average for lights of this type, the unit has many new features, including quick and easy installation and snap-ring dome fastener permitting instant removal of dome for quick -relamping.



(Circle No. 40 on Reader Service Card)

Speedometer Cable Lubricant

Lub-A-Cable, being offered by Panef Mfg. Co., Inc., is especially designed for use in speedometer service to stop needle vibration, cable noises and reduce cable breakage. A graphite lubricant, it is said to quickly penetrate the entire length of the cable, dissolving old gummy grease and providing long-lasting, thorough lubrication.

The lubricant comes in an easy-to-use plastic squeeze dispenser that can be used two ways. The spout is so designed that it can be pierced for use as a drop oiler, or cut off for direct insertion into cable.

(Circle No. 41 on Reader Service Card)

Fuel Control Systems . . . (Continued from page 26)

muffler condition through the use of a common vacuum gauge. Again, the engine must be running at slow idle and properly warmed up before an accurate check can be made. Hook up the vacuum gauge, and adjust carburetor mixture screws until the highest steady vacuum reading is obtained. Note the reading closely. Using the accelerator linkage at the carburetor, quickly accelerate the engine and allow it to return to idle.

When the throttle is suddenly cracked open, manifold vacuum should go almost down to zero, stay there for just a few seconds, and then return a few points *higher* than the normal idle vacuum. Again, in a second or two, the idle vacuum should return to normal. *IF* the muffler is offering excessive back-pressure, the vacuum gauge needle will be slow in returning to its normal idle reading. Slow in this case is a comparative word. Observing vacuum gauge readings when the sudden acceleration technique is tried on several different engines will serve to give you an idea of normal return period. Comparing this normal return to a slow return is then a little easier. The term slow means little unless it's slower than the average. It's good to try out the acceleration technique any time you have a vacuum gauge connected to an engine. After a few dry runs, you'll be able to pick out a partially clogged muffler without too much trouble.

Remember, this vacuum gauge test is *not* 100% dependable. It's only the best check a working mechanic can perform in the absence of lab-type test equipment.

BROKEN SEALS

Among the out-of-the-ordinary things a trouble-shooting mechanic must look for are broken seals. Not the transmission or axle shaft type of seals that fail and permit leakage of lubricants, but the broken spark plug and dry-type cleaner seals that either leak compression or admit dirty air. The plier-type spark plug adjusting tools have been in common use a good many years. With them, spark plug electrodes can be properly gapped quickly and easily. They're good, but they can be bad, too. They can lead to trouble in the hands of a husky mechanic who likes to flex his muscles when adjusting the gap on resistor-type spark plugs.

Squeezing down too hard on the adjusting tool can—and very often does—rupture the inner seal of the plug. Moisture from the combustion chamber slips by the broken seal and works on the resistor element. The dampened resistor drastically changes value and causes engine misfire. This can happen on brand new spark plugs, and it's not an easy thing to trace down. Just because resistor-type spark plugs are right out of the carton, doesn't mean they'll still be in workable condition after being adjusted improperly.

A broken seal can also give trouble on the dry-type air cleaner. Again, too much pressure applied during tightening is the major cause of broken cleaner seals. The cover screw should be snugged up by hand. Never should a pair of pliers be used as a tightening tool. Slight overtightening pops the seal. A broken seal allows dust laden air to enter the engine.

In extreme dusty operating conditions, it doesn't take long before the engine is badly worn because of the abrasive foreign matter. True, it might be a long time before a broken air cleaner seal can be accused of actually causing an engine to run improperly, but a good mechanic would feel just as badly about slowly ruining a man's engine as he would about leaving a rod nut loose and tearing up the block. Either case is poor workmanship.

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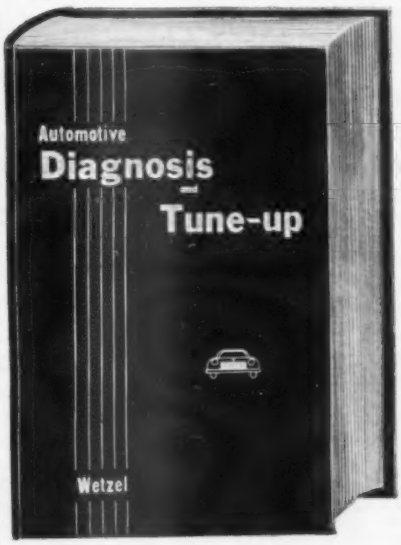

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BEARING SERVICE MANUAL . . . Free for the asking is a 98 page *Automotive Bearing Manual* containing 130 illustrations and especially edited for the newcomer in the automotive service field, as well as for the "old timer". Written in an easy-to-understand manner, the contents and illustrations of the manual are directed to the *practical* rather than to the technical side . . . covering the purpose of an engine bearing—the all-important job it has to do—and then describing in detail methods for recognition, diagnosis and correction of engine bearing difficulties. Send for your copy today.

(Circle No. 45 on Reader Service Card)

WARNING LIGHTS . . . Complete line of 360° revolving warning lights are shown in Trippe Mfg. Co. catalog. Latest addition to line is Magna-Vac, which with a combination of magnet and vacuum "sticks like glue" to roof, fender, front or rear window deck. Revolving parabolic mirror flashes 60 times a minute. Stands over 7" high, nearly 6" in diameter, yet weighs only 2 lbs. Plugs into cigarette lighter.

(Circle No. 46 on Reader Service Card)

WHEEL SERVICES . . . Bear Mfg. Co. 20-page catalog C-359 is said to contain the most complete showing of wheel aliners and gauges, wheel balancers, body and frame straighteners, headlight and brake testers, wheel and hub presses, tire truers, wheel balance weights and other wheel alinement tools and accessories. Your copy is free for the asking.

(Circle No. 47 on Reader Service Card)

VALVES AND COMPONENT PARTS . . . The new 1959 Valve Catalog now being offered by Rich Mfg. Corp. is up to the minute and lists exhaust and intake valves in conjunction with the other valve train parts, for all 1958 and most 1959 models of all makes of passenger cars and trucks. Industrial and air-cooled engine applications are also included. The catalog provides complete information on valves, guides, seats, tappets, rotokits, rotocaps and valve spring inserts.

(Circle No. 48 on Reader Service Card)

BRAKE SERVICE MANUAL . . . The new 316 page Grizzly Brake Service Manual provides instructions for performing brake service on all passenger car hydraulic brake systems from 1950 through 1959, and all power brake units from 1955 to 1959, with full explanation for installation and adjustment of each type of brake. Trouble shooting charts are included for fast and easy direction and correction of brake problems. The manual fully explains fundamentals of brake operation, covering the how-to-do-it phase of brake work and the engineering and design principles of brake systems.

Price of Manual, $7.50. Order direct from Grizzly Brake Division, Dept. ASD, 700 Caroline St., Paulding, Ohio.

WHEEL BALANCERS . . . John Bean Division's latest four-page catalog (L-1648) illustrates and describes their three newest on-the-car wheel balancers. Catalog L-1644 describes their new low-priced wheel balancing "package" which permits repair shops to enter the wheel balancing business for an investment of less than $100.

(Circle No. 49 on Reader Service Card)

AUTO SPEAKER KITS . . . "Speed-Kote" spray can products, wire strippers and other tools, switches and other components, are described and illustrated in latest 12 page catalog (S-100) available from Nemco-Speedex Mfg. Co.

(Circle No. 50 on Reader Service Card)

TROUBLE-SHOOTING CHART . . . for carburetor tune-ups is being offered by Hygrade Products Div., Standard Motor Products, Inc. which locates the sources of seven common types of carburetor trouble and gives specific causes and remedies. The three-color, 17" x 22" wall chart employs a simple alphabetical code which enables the user to quickly match symptoms to remedies. A special feature is symbols that tell mechanics when a remedy requires removal of carburetor and when it does not. Send for your free copy today.

(Circle No. 51 on Reader Service Card)

MUFFLER INSTRUCTION CARDS . . . A set of six muffler installation instruction cards are available from Maremont Muffler Div. Designed for posting in service areas, the cards are said to be a reference source for difficult installation problems on many of the new cars. Also given on the cards are the dangers of carbon monoxide poisoning as well as exhaust system needs.

(Circle No. 52 on Reader Service Card)

WHEEL AND BRAKE PARTS . . . 24-page catalog of wheel and brake parts for trucks, trailers, tractors and buses is available from Euclid Automatic Machining Co. Wheel part line includes inner and outer cap nuts and shoulder, buss type, wheel, rim clamping, and drive studs. Brake part line includes brake shoe rollers and roller pins, brake anchor pins and felts, brake shoe bushings and return springs, camshafts, brake spiders and shoes, slack adjusters, and brake shoe bolts, nuts and washers, as well as a complete line of other brake parts.

(Circle No. 53 on Reader Service Card)

REPLACEMENT FILTERS . . . Just off the press by Champion Laboratories is their most complete and handiest cross-reference catalog. Contents include cross reference charts for oil filter replacement elements, cross reference charts for factory installed filters for passenger cars, including foreign makes, cross reference charts for trucks and buses as well as cross reference charts for agricultural, construction, industrial and marine engines.

(Circle No. 54 on Reader Service Card)

"QUICK SPOT" LIFT . . . is the name of the latest two-post model lift being offered by Joyce-Cridland Co. and described in a new six page brochure (Bulletin 155-L). Copy and illustrations point out the easy accessibility to all profitable service points, chiefly the front and rear ends where 92% of all service work is performed.

(Circle No. 55 on Reader Service Card)

You may want this information, and most of it comes to you free. Just circle the key number on the Reader Service Card corresponding to the one that appears with the editorial review. Our Reader Service Department will forward your inquiry to the manufacturer or supplier for attention.

BRAKE SERVICE . . . A free, 8-page booklet that tells how to spot and sell a brake service prospect is now being offered shop operators by Ammco Tools, Inc. Entitled "How to Earn Big Profits in Brake Service," the booklet explains the tremendous brake service potential, and tells how each shop can realize bigger profits in brake service. It explains how to make brake work fast and easy, and why customers like the convenience of having all work done at one shop and how sales from related parts mean added profits. In addition, there's a helpful check list of brake service equipment and accessories needed to get into the brake service business.

(Circle No. 56 on Reader Service Card)

EPOXY CEMENT . . . Smooth-On Mfg. Co.'s latest bulletin shows typical applications of their Metalset A-4 epoxy resin aluminum cement for filling seams, caulking, bonding, repairing pattern defects and using as a seal where constant, heavy vibration is involved. As a result of a new formula, Metalset is now available in tubes identical by both weight and volume to facilitate mixing and reduce waste.

(Circle No. 57 on Reader Service Card)

SAFETY GLASS . . . Latest Libbey-Owens-Ford Glass Co. booklet for the auto glass replacement trade has illustrations of approved methods of handling safety glass, good shop layouts, storage facilities for glass and tools, methods of handling the glass, making patterns, edge work and polishing, as well as installing the glass. Also contains considerable data on plastic and kinds of glass, as well as a list of needed shop tools.

(Circle No. 58 on Reader Service Card)

TOOL USER'S GUIDE . . . now being offered by S-K/Lectrolite Tools is designed to help tool users reach an informed decision when equipping themselves with socket wrenches and flat wrenches. Complete range of tool sets is divided into functional groups, accompanied by captioned photographs picturing the types of jobs for which the sets are suited. Guide also contains detailed descriptions of most items in the company's line, complete with user prices.

For your copy send 10¢ to cover handling costs, together with your name and address, to: Tool User's Guide, S-K/Lectrolite Tools, Box 993, Lima, Ohio.

BRAKE SERVICE . . . Latest Paul-Marsh service manual deals with servicing standard hydraulic and power brakes. Covers fundamentals of operation, trouble shooting and diagnosis, major and minor brake adjustments, wheel and master cylinder service as well as brake drum service for the nine different types of brakes used on passenger cars from 1950 through 1959.

Complete power service is also covered for Bendix, Moraine, Midland, and Kelsey-Hayes, including fundamentals of operation, complete diagnosis charts as well as overhaul procedures. This includes all power brakes used on passenger cars as a factory installation item from 1955 through 1959.

Price of manual—$7.50. Order from Paul-Marsh Co., 520 W. Fort St., Detroit 26, Mich.

Calendar of Automotive Events

1959

June 24-27—Independent Garage Owners of America, Inc. (IGOA) National Convention, Albany Hotel, Denver, Colo.

Sept. 14-17—National Auto Accessory & Parts Exhibit, Exhibition Hall, Las Vegas, Nevada.

Sept. 27-29—Southeastern Automotive Marketing Assn., First Convention, Biltmore Hotel, Atlanta, Ga.

Oct. 28-30—Automotive Parts Rebuilders Assn., 12th Annual Convention, Hotel Roosevelt, New Orleans, La.

Nov. 2-5—Automotive Warehouse Distributors Assn., Annual Convention and Manufacturers'-Distributors' Conference, Muehlebach Hotel, Kansas City, Mo.

Nov. 13-15—Calif. Automotive Wholesalers Assn., Convention, Miramar Hotel, Santa Barbara, Calif.

1960

Jan. 25-28—33rd Annual National Auto Accessories Exposition, Navy Pier, Chicago, Ill.

Jan. 30-Feb. 3—National Automobile Dealers Association Annual Convention and Equipment Exhibition, Shoreham Hotel, Washington, D. C.

March 10-13—Pacific Automotive Show, Denver, Colo.

WHEN CHANGING YOUR ADDRESS

Please notify us 5 weeks in advance. Supply us with both your old and new address, including address label from current issue if possible. Copies we mail to your old address will not be delivered by the Post Office unless you pay them extra postage. **Mail address changes to Circulation Dept. Automotive Service Digest, 900 South Wabash Ave., Chicago 5, Ill.**

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Sidney Glass & Rad. Shop, Sidney, Mont., grossed $10,784 in a year!

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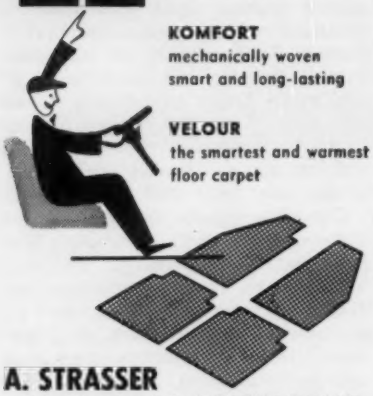
floor carpet



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We want reputable wholesalers in the automotive service trade for the distribution of our products in the U.S.A.

After TorqueFlite Service Flush Torque Converter

In the event a TorqueFlite transmission becomes inoperative due to the failure of one of the components, Chrysler Service Department states it is imperative that the torque converter be thoroughly cleaned by flushing to remove all foreign material and prevent its re-entry into the hydraulic system after transmission service.

The factory recommends the following procedure for flushing the unit.

Slowly pour 2 quarts of new, clean kerosene into the torque converter hub, using a long-spouted can. Before this can be done, however, it is necessary to reach into the torque converter with a screwdriver and turn the torque converter stator hub counter-clockwise (large splined hub) so that one of the ⅛" x ⅜" rectangular slots on this assembly is visible at the top. Since there is a second slot (directly below), an adequate opening is provided for the kerosene (if poured slowly). After the kerosene is in the torque converter, seal the hub opening with a cardboard cap and masking tape.

Rotate the converter approximately 10 seconds by cranking the engine with the starting motor and the coil wire disconnected to prevent engine from starting. Then drain the converter by removing the drain plug and masking tape.

Realign the stator hub and repeat the above procedure until the drained kerosene is clear. To complete the flushing procedure, rotate the converter with the drain plug removed. This will remove any residual solvent and trapped dirt. Reinstall the drain plug or plugs, install the transmission and fill with fluid.

Check Valve Cover Fit

According to a recent Plymouth Service Bulletin, a tapping noise sometimes occurs due to the valve rocker arms or springs striking the valve covers. This condition can usually be determined by exerting upward pressure on the cover.

Generally, it is possible to correct this interference by loosening the valve cover retaining cap screws and by repositioning the cover before tightening the retaining cap screws.

In some cases, however, it may be necessary to slightly dimple the cover from the inside at the contact area.

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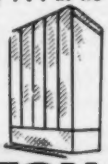

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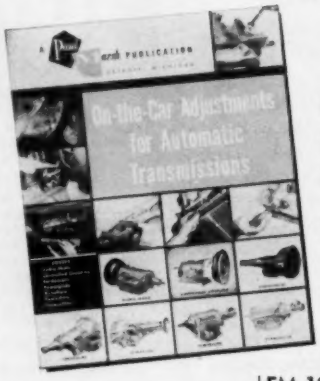

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BRUSHING UP ON THOSE

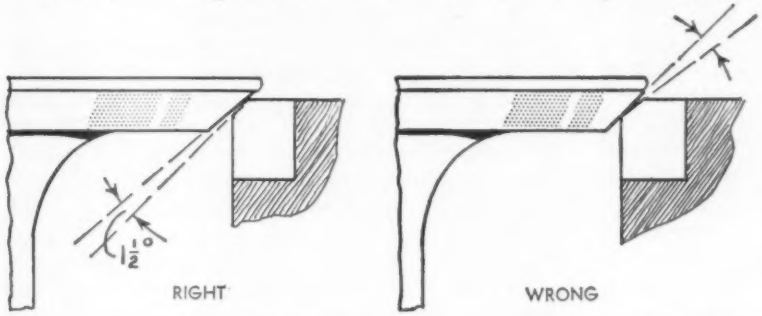
EASY-TO-FORGET THINGS

Refresher course

✔ *Interference Angle*

• IN SPEAKING OF valve faces and valve seats, mention sometimes is made of the interference angle. The latter is merely the use of a different face angle and different seat angle.

In reconditioning exhaust valves, the interference angle works out well where the valve and valve seat inserts are made from relatively hard materials.



Positive interference angle varies from ½ deg. to 1½ deg. Right: negative interference angle, which should be avoided.

From the illustration it will be seen that the use of interference angle makes for a line contact between the valve face and seat.

The difference between face and seat angles usually varies from ½ deg. to 1½ deg. The included angle of the valve face always is less than the seat to assure valve contact at the top of the seat. It is called a positive interference angle. At the right, in the illustration, is shown a negative interference angle. This should be avoided as deposits are likely to accumulate on the valve face and seat.

Tool Tips
for the Mechanic

'54 and '56 Hydramatics

Snap-on® S-8652A Ford Brake Wrench saves time on hydraulic work. It holds the 5/16-inch nut, located underneath the car floor, while making adjustments, after the 3/4-inch nut is broken loose. Check page 72 of *Snap-on* Catalog W.

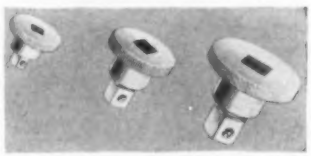
Windshield Wiper Tension

Use *Snap-on* MT-103 Distributor Point Tension Gauge for testing tension on windshield wiper arms. For instance, a 12-inch blade should have 12-ounce tension on the arm. See page 73 of *Snap-on* Catalog W.

DeSoto Power Steering

The MT-103 Gauge mentioned above is also valuable for checking drag on the 1958 DeSoto power steering.

NEW TOOL



***Snap-on* FTL-703**
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These handy units work between the socket handle and your *Snap-on* ratchet wrench. Lets you run nuts up or down with your fingers when the nut is too loose to overcome friction of ratching mechanism. Set contains three spinners with 1/4, 3/8 and 1/2-inch square drives.

New set. See your *Snap-on* man.

Buick & Nash Transmission Work

Snap-on BF-61 Sperti Pull Jack saves up to three hours removing transmissions in Buick and Nash cars — without removing the rear axle and torque tube assembly. Attach jack to the rear axle housing and rear frame cross member, then tighten it to pull the housing and torque tube back far enough so the transmission can be removed. You only disconnect the hydraulic brake flexible hose. See page 111 of *Snap-on* Catalog W.

Get your copy of the new *Snap-on* Catalog W. Ask your *Snap-on* man or write direct. Watch for further Tool Tips.

SNAP-ON TOOLS CORPORATION
8035-F 28th Avenue • Kenosha, Wisconsin
(Circle No. 131 on Reader Service Card)

Gears . . . *(Continued from page 19)*

bearing pre-load. The pinion shaft retainer nut must be tightened so that a 1½- to 2-lb. pull is necessary to turn the pinion shaft in its bearings. This pre-load can be roughly established by torquing the pinion shaft retainer nut until the torque required to turn the companion flange is 15 to 25 in.lbs.

For accurate adjustment, a special companion flange holding tool and an accurate pull scale are necessary. The scale fits into special notches of the holding tool so that a definite reading can be obtained at a definite point of force application.

When just the right amount of torque has been applied to the pinion shaft retaining nut, the bearing spacer will partially collapse to create the necessary pre-load on the pinion bearings.

ALL ADJUSTMENTS MUST BE PRECISE

Next, the ring gear is bolted to the differential case. All attaching bolts should be evenly torqued 40 to 60 ft.lbs. Lubricate the hubs of the differential side gears and install them in the case. Roll the differential pinion gears into place, and install the pinion shaft. Secure the shaft by installing the shaft locking screw.

Install the differential case—including the bearing cups—into the differential carrier. Install the adjusting nuts and the bearing caps. Make sure the cap scribe marks are in alignment, then install the cap bolts and draw them up snugly. Use an adjustment tool to remove all back-lash from between the ring gear and pinion. Do this by tightening the left hand nut until all back-lash is removed, then back off the nut one notch.

Then, tighten the right hand nut until the bearing rollers just start to move, plus a minimum of one, or a maximum of two more notches. This procedure pre-loads the differential case bearings.

Mount a dial indicator on the carrier so that the indicator needle just touches a tooth of the ring gear. Rock the ring gear back and forth to determine the remaining amount of gear back-lash. This should be .005- to .008-in. If necessary, turn each adjusting nut an equal amount in the same direction to bring back-lash within limits.

SET CORRECT RUNNING MESH

To check ring gear and pinion running mesh, coat the ring gear teeth with Prussian blue or red lead. Turn the companion flange several times in each direction to determine tooth contact by the pattern developed with the marking material. It's a good policy to apply as much drag as possible to the gears to obtain a true running pattern. This can be done by holding the companion flange retaining nut with a deep socket, and rocking the ring gear with a wrench applied to one of the ring gear attaching bolts.

If necessary, the adjusting nuts must be relocated (while retaining pre-established back-lash), and/or pinion shims must be added or removed to obtain the best possible tooth contact, as indicated by the pattern of the marking material.

When the correct pattern is obtained, the marking material is wiped off the gears with a cloth moistened with kerosene, the bearing cap bolts torqued to 115 to 125 ft.lbs. and the lock nuts installed. Then the differential carrier assembly is installed in the axle housing.

All this detailed procedure is absolutely necessary if the spiral bevel ring gear and pinion are expected to operate as quietly and efficiently as they were designed to do. This rear axle overhaul and adjustment is only representative of the kind of care and attention precision automotive gears must be given by the service mechanic.

LUBRICATION

The final performance factor in the maintenance of modern gearing is correct lubrication. Let's continue with the example of the rear axle assembly.

Prior to 1947 there were many types and varieties of gear lubricant designations. Each designation tried to describe both the lubricant and the operational condition of the gears under normal operating conditions.

In January 1948, the American Petroleum Institute adopted API Specifications which made the job of selecting and recommending satisfactory gear lubricant much simpler and more practical. Gear lubricants are now classed as Regular-Type, Worm-Type, Mild-Type EP (EP means Extreme Pressure), Service Application, and Multipurpose.

Originally, regular-type gear lubricant was recommended for use in spiral bevel rear axles. With increased engine power and slight changes in rear axle design, the regular-type lubricant became "not tough enough" to perform satisfactorily. Now, most manufacturers recommend the Multipurpose gear lubricant for rear axle use.

In addition, SAE viscosity numbers were assigned the various classes of gear lubricant to aid further in the selection of the right lubricant for the job. To prevent confusion with engine oil classifications, gear lubricants were assigned SAE numbers considerably higher than those assigned to engine oils. It doesn't follow that a SAE 20 engine oil is much "lighter" than an SAE 80 gear lubricant. Actually, the two have virtually the same viscosity. Gear lubricants are classified according to viscosity as are engine oils, but the numbers assigned to gear lubricants to indicate viscosity are numbers of a higher series than those assigned engine oils.

DON'T MIX LUBRICANTS

Only gear lubricant of the correct class and viscosity should be used, or recommended. All manufacturers specify the correct lubricant for their units in their lubrication guides.

It is vitally important, however, that mechanics **never** mix different brands of gear lubricant. Some lubricant manufacturers use base ingredients that just aren't compatible with the lubricants sold by other manufacturers. A common non-compatible pair of lubricants are those containing sodium and those that contain lithnium. Unless you are unusually well informed on the subject, it's not possible to determine which is which. They both do a good job as gear lubricants, but they just **can't be used together.**

The only way to be sure is not to re-use gear lubricant. Always fill the gear box with fresh lubricant **after** the old lubricant has been completely drained.

The gears used in today's automobiles are very similar to those which have been used for many years. Gear applications have broadened, but basic gear design has remained quite stable for some time. This is good news for the service mechanic because he needs only a sound knowledge of general gear terminology and design intention.

Gear replacement and adjustment procedures, however, can vary from one make to another and from one year to another. These must be learned by the mechanic as the need arises, but the fundamental story of gearing apparently will not change for many years to come.

Using Wrong Piston and Push Rod In Master Cylinder Means Trouble

On General Motors cars with regular brakes, the master cylinders used a 1″ piston and push rod, as shown in Fig. 1, as follows:

Chevrolet	1936-55	Oldsmobile	1939-58
Buick	1937-57	Pontiac	1936-57
Cadillac	1939-57	Corvette	1953-58

FIG. 1

FIG. 2

In 1958, Buick, with regular standard brake master cylinders, adopted a piston and push rod slightly different, as shown in Fig. 2.

Care must be taken that these pistons, rods or both are not used except as intended. If the old short pointed rod is used in a new deep hollow piston, pedal stroke will be lost. If the long pointed rod is used in a shallow piston, the brakes will lock up, after a few applications.

Studebaker Valve Clearance

The valve clearance specification used in Studebaker 59S passenger car and 4E1 and 4E5 truck models is .018″ and the adjustment is made with the engine cold. Tests prove that the engine will operate more efficiently and without noise at this setting.

Although the valve covers are stenciled "Valve Clearance .016″ Cold," the clearance is set at .018″. When present stock of valve covers is exhausted, the new covers will carry the new specification.

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Instrument Corner . . .

(Continued from page 59)

pressure and full stroke, very large bubbles in the fuel can be compressed to small size in the pump, and forced on through the carburetor.

"But a drop in pressure not only increases the size of the bubbles, it also makes them harder to handle, and reduces the volume that can be forced through the calibrated float needle valve in a given time. And a worn pump drive cam, or worn pump linkage shortens the pump stroke—reducing fuel delivery capacity.

"Still another cause of insufficient fuel volume is leaky check valves. These often result from dirty fuel."

BUYING "TROUBLE INSURANCE"

Although his companions weren't restless, Jim paused and smiled a little sheepishly. "Didn't mean to turn this into a lecture," he said.

"We're not kicking," Tom said grinning. "Look's like we'll have some extra business coming up—and you're 'setting us up' to handle it!"

"Takes a little more than just words," Jim shot back immediately. "You'd better be equipped to make the right tests—on fuel pumps.

"The best insurance against vapor lock is to have the fuel supply system in first-class condition. As I said, a pump in 'top shape' can handle a considerable amount of vapor."

The Instrument Man took a last sip of coffee and glanced at his watch. "Time to hit the road," he said, pushing back his chair.

As the three of them moved toward the cash register, Jim drove home his points with a few concluding words.

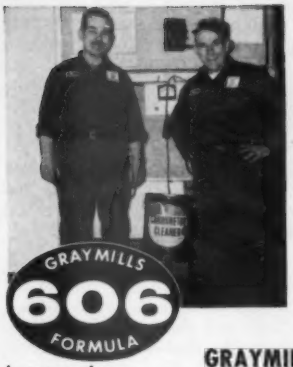
"Get your fuel-pump testers working, boys . . . and don't forget that the volume test should always be part of your check-up.

"You make the volume test with the engine running on the gas in the carburetor, and the fuel line disconnected. Measure the length of time it takes to draw a pint of gasoline from the tank; and see that it's according to manufacturer's specs.

"The fuel pump pressure has to be up to the manufacturer's specs too, of course. To measure it correctly, connect a pressure gauge in the line on the discharge side of the pump. With the engine turning over, pressure gauge should show a reading of from 1½ lbs. to 5½ lbs., depending on the pressure specified for the car."

At the door they parted to rush back to their jobs—The Instrument Man getting in the last word:

"Don't forget boys, the best tune-up in the world won't make the car run if the engine isn't getting fuel."



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it has all the high qualities a carburetor cleaner should have, economical, fast, easy on the hands, very little odor and a perfect water rinse."

Signed testimonial from service men at Bayer City Service, 49th and College, Indianapolis, Ind.

leaves no odor—cleans faster.

GRAYMILLS CORPORATION
3736 N. Lincoln Ave., Chicago 13, Ill.

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Electric Auto-Lite Co., The . . . . . 22 and 23

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Felt Products Manufacturing Co. . . . . Cover 4
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Graymills Corp. 81
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Hall-Toledo, Inc. . . . . *
Hamilton Hotel 76
Harvey E. Hanson Company . . . . . *
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Hein-Werner Corp. . . . . *
Hotel Claridge . . . . . *
Houser Engineering & Mfg., Inc. 68

Ingersoll-Rand Company . . . . . 50 and 51
Inland Manufacturing Co. 75

Jak Pack Manufacturing Co. . . . . *

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Kedman Company 79
Kem Manufacturing Co. . . . . *
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Lee Company, K. O. 63
Lee Plaza Hotel . . . . . *
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Mac's Super Gloss Company . . . . . *
Magnaflux Corporation 73
Master Technical Press 73
McQuay-Norris Mfg. Co. . . . . *
Milesmaster, Inc. . . . . *
Miley Company, L. J. . . . . *
Milwaukee Electric Tool Corp. 12
Mustang Engines . . . . . *

National Brake Block Company 71
National Market Reports, Inc. 65, 69, 80
Niehoff Company, C. E. . . . . *

Otto Items, Inc. . . . . *

Paul Marsh Co. 76
Perfect Circle Corporation . . . . . Cover 2
Permatex Company, Inc. . . . . 1, 79 and 81
Practical Manufacturing Co. . . . . *

Rajah Company . . . . . *
Ramsey Corporation . . . . . Cover 3
Ren Plastics, Inc. . . . . *
Rich Manufacturing Co. 67
Rinck-McIlwaine, Inc. . . . . *
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Sealed Power Corporation 9
Shurhit Products Company . . . . . *
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Sunnen Products Co. 61
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Wagner Electric Corp. . . . . 38 and 39
Westberg Mfg. Co. . . . . *
Winona Tool Mfg. Co. 79

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HE WHO LAUGHS, COME WHAT MAY,

WILL LIVE TO LAUGH ANOTHER DAY

Short circuit smiles

The drunk sitting at the bar was adjacent to a man and his wife. Suddenly the drunk came forth with a resounding burp.

"How dare you belch before my wife," thundered the husband.

With that the drunk unsteadily got off the bar stool and making a sweeping bow said, "A thousand pardons, sir . . . I did not know it was the madam's turn."

★ ★ ★

MY GET UP AND GO
HAS GOT UP AND WENT

How do I know my youth is all spent?
Well, my get up and go has got up and went.
But in spite of it all, I am able to grin
When I think of where my get up has been.

With my ears in the drawer, my teeth in the cup
My eyes on the table, until I wake up:
Ere sleep dims my eyes, I say to myself
Is there anything else that should be on the shelf?

I am happy to say as I close the door
My friends are the same, only perhaps even more
When I was young and my slippers were red,
I could kick my heels right over my head,
When I grew older, my slippers were blue,
But I could still dance the whole night through.

Now I am old—my slippers are black
I walk to the store, and puff my way back
The reason I know my youth is all spent
My get up and go—has got up and went.

But really I don't mind when I think with a grin
Of all the grand places, my get up has been
Since I've retired from life's competition
I busy myself with complete repetition
I get up every morning and dust off my wits
Pick up my paper and read the obits
If my name is missing, I know I'm not dead
So I eat my breakfast, and go back to bed.

Author unknown

Then there's the sultan who kept his harem three miles from where he lived. Every day he sent his servant to get a girl. The sultan lived to be 87, but the servant died when he was 40.

Moral: It's not the woman that kills you but the running after them.

★ ★ ★

A pink elephant, a green kangaroo and two yellow snakes strolled up to the bar.

"You're a little early boys," said the bartender, "he ain't here yet."

★ ★ ★

"How did George go through his rich uncle's inheritance so fast?"

"Well, he spent a good bit of it on wine, women and song. The rest he squandered."

★ ★ ★

And then there was the efficiency expert, who put unbreakable glass in all of the fire alarm boxes.

"'Sound as a dollar,' I said, as I patted the hot muffler."

An Irishman named O'Shea came to America and wanted to attend a big league ball game. To his dismay, he found all seats were sold out. However, the management gave him a high flag pole seat. When he returned to his own country, his people asked him: "What kind of people are the Americans?"

He said, "Fine people. They gave me a special seat at the ball game, and just before the game started, they all stood up and sang, "O'Shea, can you see?' "

★ ★ ★

When the man returned from his vacation, a friend asked: "Did you fish with flies?"

"Fish with flies!" exclaimed the vacationer. "I hope to tell you I did. I fished, camped, dined and slept with 'em."

★ ★ ★

When the examination was over, the teacher in a mountain school told her pupils to write a pledge that they had neither received nor given help. One gangling youth, who had squirmed in dismay and mopped a bewildered brow throughout the ordeal, wrote: "I ain't received no help in this matter, and God knows I couldn't have gave any."

★ ★ ★

Sign in a department store window: For Sale — Bath towels for the whole damp family.

★ ★ ★

Angry wife to meek husband: "That ten dollars that was in your pants pocket last night—did you steal it out of my purse this morning?"

★ ★ ★

It wasn't exactly that the 7-year-old disliked going to church; his chief objection was the long pastoral prayer.

So he was naturally apprehensive when his father asked the visiting minister to say grace at dinner. But the prayer was brief and to the point. In pleased surprise the youngster looked up and observed: "You don't pray so long when you're hungry, do you?"

★ ★ ★

"How do you do, my dear?" said the old lady to the little girl.

"Quite well, thank you," was the polite reply.

There was a pause and then the old lady asked, "Why don't you ask how I am?"

"Because," said the child calmly, "I'm not interested."

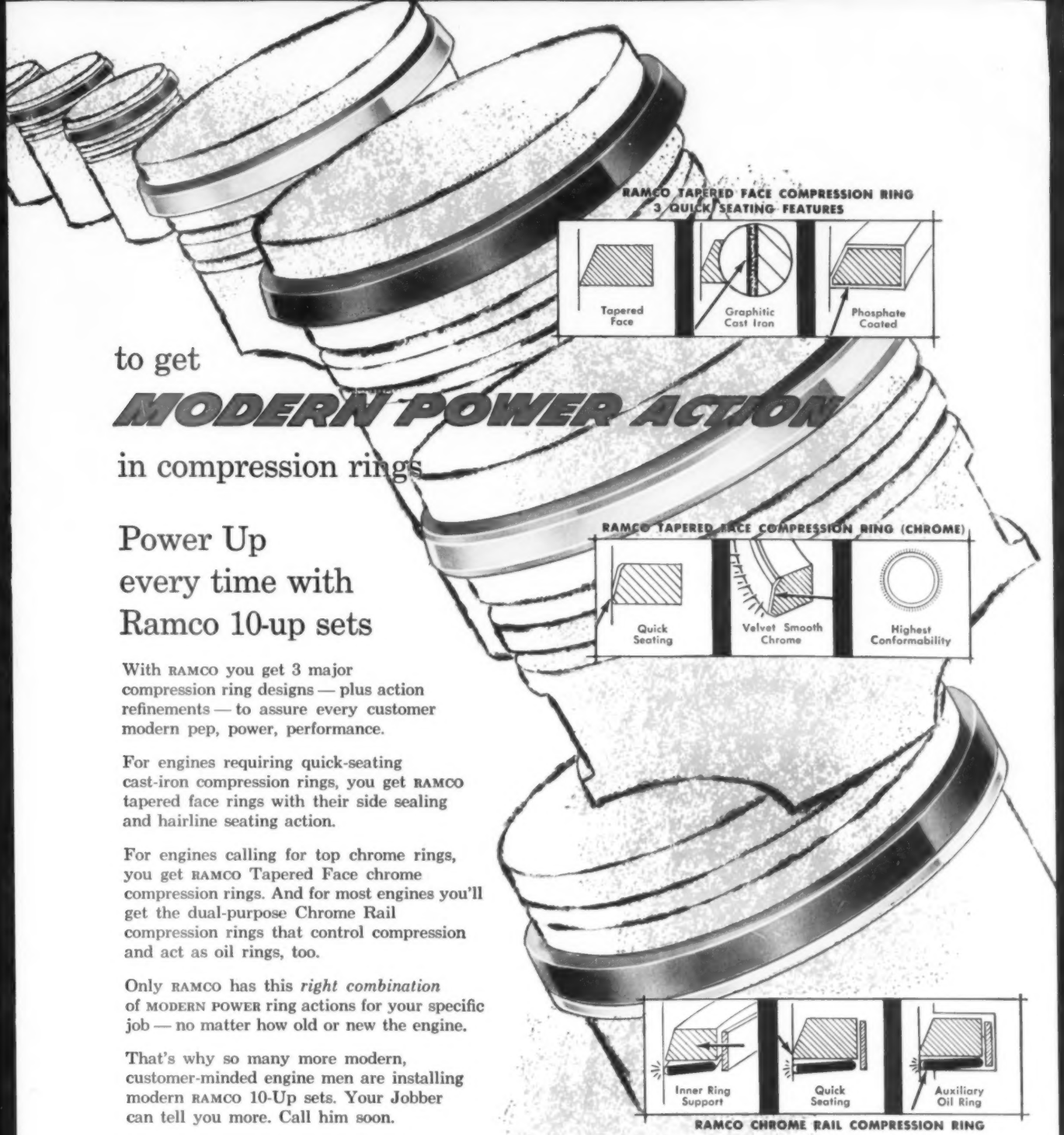
★ ★ ★

It had rained heavily all day and the camp was completely flooded. Going his rounds just before "lights out," the sergeant came upon two of his men washing in the flood water.

"Shame on you fellows," he bawled at them. His voice brought an officer to the scene.

"What's the trouble, sergeant?" asked the officer.

"Why these men are washing themselves in the water they are going to sleep in," was the disgusted reply.



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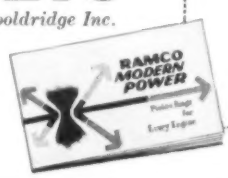

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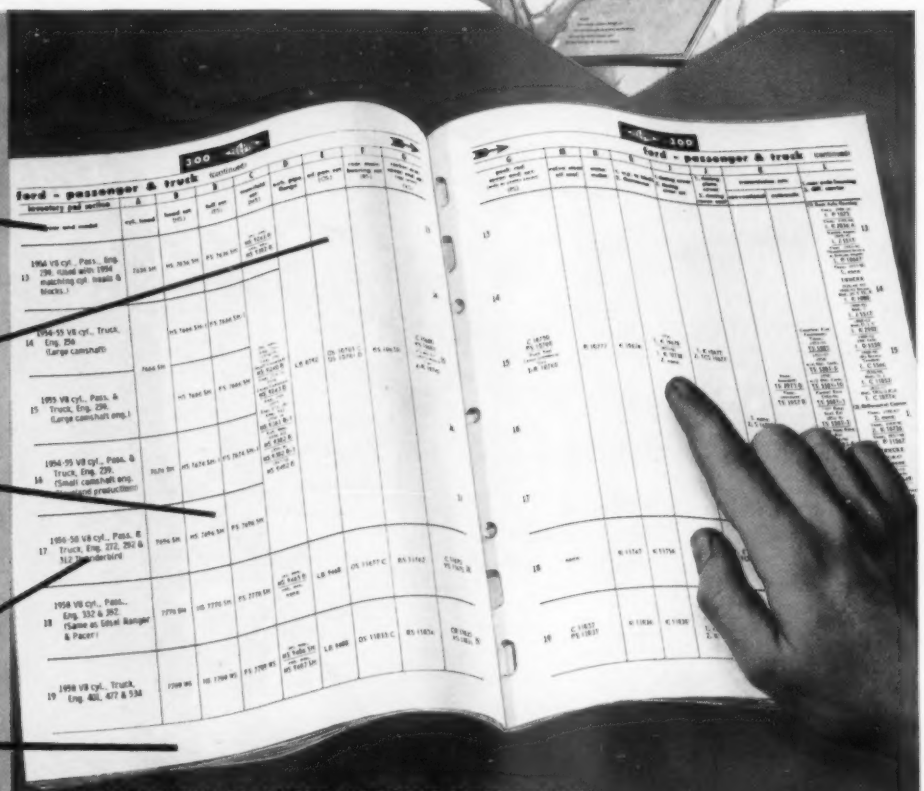

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